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Gardening the Desert, Deserting the Garden:

**Culture, Agriculture and Ecology
on the Northern Plains, 1830-1930**

A Thesis submitted by Ben Larson

in fulfillment for Honors in Environmental Studies

Oberlin College

December 2, 1991

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Acknowledgements

So many people have made this project possible—indeed, enjoyable!—and I sincerely thank all of them. They have generously given of their expertise, time, and trust. I have been lucky to have worked with them. Edie Swan first introduced me to Plains anthropology, and has been a friend ever since. Tom Connelly was a sure-footed guide in the slippery realm of cultural ecology. Eric Higgs talked about technology intelligently, and in so doing spurred more than he knows. Gary Nabhan piqued my curiosity in Indian agriculture and, among other things, tumbleweeds. His seeds still sprout. Kelly Kindscher showed me which prairie plants to eat while sharing his knowledge on plains ethnobotany. John Gardner supported what to many in his field would have seemed like a far-fetched plot. In the process he taught me about Plains agriculture, past and present. My gratitude to him runs deep. Lydia Sage-Chase also invested her trust in the garden, and offered seeds as well as her personal knowledge of Mandan history, culture, and (last but not least!) cooking. Fred Schneider gave seed as well, and first suggested that I undertake a project of this sort. He and Mary Jane Schneider advised me on Village Indian prehistory; I thank them for their hospitality. Carolyn Grygiel's insights into Plains ecology were disturbing--and most suggestive.

I benefitted from critiques of an earlier, abridged version of this paper. I've incorporated many of David Danbom's suggestions regarding the historical interpretation of homesteaders. Frank Popper gave the gift of provocative thinking and engaging correspondence. Richard Ford corrected some ethnobotanical oversights, and offered some of his own insights into Plains Indian economics.

At Oberlin, I have Clayton Koppes, David Orr, Roger Laushman and Edie Swan to thank for advising me. Their help extends beyond this project. As natives, Clayton Koppes and Roger Laushman recognized a plainsman in-the-making; flickers of recognition go a long way indeed. In particular, Clayton Koppes guided me in environmental history, and has been a most helpful critic of my writing. Roger Laushman taught me about Plains ecology, and in the process told me which plants *not* to eat (oops, too late!). David Orr helped me to articulate big and pressing issues in agriculture; his resolve and courage to solve them has been inspiring.

I wish to acknowledge the help I received from the staff and other researchers at the Carrington Research Extension Center. Likewise, the assistance of the library staff at both North Dakota State University and Oberlin College was indispensable. Some of this research was supported by a Mellon Grant from the Environmental Studies Department at Oberlin College. And I thank Kevin Kauffman for his patience and perseverance in typing this manuscript.

Of my friends, I want to thank David, Katie, John, Adam, Sharon, Joyce, and Lars. They all helped in so many ways.

And lastly, I thank my mother and especially my father, who took my brothers and I hunting on the Plains. For me, this project has been an expansion upon those formative forays, without which I might never have started exploring the Plains.

I dedicate this essay to the memory of Melvin Gilmore, George Will, Gilbert Wilson, and to the living memory of George Jones. In their own way each saw the beauty in plants and found meanings in planting them. It has been my good fortune to have been taken to the field first with my father and then to have followed in the footsteps of men like these.

Preface

Between 1830 and 1930 the northern Plains underwent sweeping changes. Cataclysmic conflict between Indians and whites, imposition of the American settlement system, and integration into the national economy all altered the region and how people lived there. Revisions in agriculture were part of these changes but also played their own role. As the dominant form of land use, and the direct or indirect occupation of most residents, agriculture has an important part in shaping landscapes and lifeways in the northern Plains. Of course, changes in agriculture between 1830 and 1930 dramatically affected the people and the land; to suggest the nature and degree of these changes, the kind of agriculture practiced in 1830 and that practiced in 1930 can be strikingly contrasted.

In 1830 agriculture was practiced by Mandan, Hidatsa, and Arikara Indian women, whose villages were strung like beads along the Missouri River. With hoes they cultivated small fields, which were carved out of the forests along the river. In each field corn, beans, squash, and sunflowers were planted together, until a field was fallowed a few years later. In addition, Village Indians hunted buffalo and gathered wild plants from the uplands, which was then a mosaic composed mostly of grass but dotted with a diversity of other plants. Through nomadic tribes, who lived and hunted buffalo on the Plains, the Villagers participated in trading networks that extended literally across the continent. Agriculture in the Villages was woven into the fabric of Indian cultures, and worked in concert with disturbances that occurred naturally on the Plains.

By 1930 Indians were still farming, but in the intervening hundred years the social, economic, and ecological contexts of agriculture had been utterly altered. No longer did the nomads ride, the buffalo roam, or the prairie fires rage. Fences carved up what used to be an endless expanse of grass. Much of the grass itself had been plowed asunder, exposing the soil below to the sun, rain, and wind. Isolated homesteads dotted the countryside, which now was a checkerboard of wheat, barley, and flax. Railroads and highways linked that flat hinterland to the nation at large and the world beyond. Farmers were as much businessmen as the yeomen Jefferson had hoped would inhabit the new territory. As fast as possible they were buying machines, accumulating debt, saving labor,

and increasing productivity. The northern Plains had become, as its denizens proudly came to call it, "The Breadbasket of the World."

I have two aims in this essay. First, I try to understand how various peoples and the northern Plains interacted through time—an engrossing and worthy study in its own right—and one which explains how alterations like those listed above affected the Plains environment and those who lived there. Secondly, I try to put the region's current agricultural problems into historical context. By doing so I hope to help alleviate those problems by better defining their causes, nature, and complexities.

I believe that the origins of many current agricultural problems can be traced back to the period between the mid-1800s and the early 1900s, for the modern, industrial system of agriculture was developed during this period. By 1930 the social and economic structures undergirding that system had either been established or were in incipient form. Nuclear-family ownership and operation, support for applied science and technical innovation, large investments in machines, heavy and routine indebtedness, dependence on export crops, and increasing reliance on fossil fuel inputs all characterized most farms by 1930. Undoubtedly, important changes have occurred since the 1930s. Among others these include an array of government programs (many of which at first aimed to ameliorate the effects of Depression and the Dust Bowl), increased scientific knowledge of agriculture and its ecological ramifications, new technologies, increased environmental regulation, and a neo-agrarian resurgence of sorts. Despite these modifications, the basic assumptions and institutions underlying Plains agriculture remain unchanged, and the problems involved in this agricultural system still reverberate across the region.

These problems now loom as large as the Plains itself. Ecological, economic and sociological trends all indicate that the region is in dire straits. Topsoil erosion, though beyond the pale of public awareness, is in fact worse now than during the Dust Bowl. Even less visible is salinization, which results in part from summer fallowing, a cropping system widely adopted in the early 1900s. Over three million acres across the northern Plains have already been lost to salinization, and millions more acres may soon be similarly lost.¹ More than half of the prairie potholes, the nesting places of migratory waterfowl and the home to many other species, have been drained or otherwise altered. As many as

80,000 acres of wetlands will be drained in the process of finishing the Garrison Diversion Project. The project aims to irrigate 250,000 acres of already-productive land, but building its extensive canals will entail the destruction of 200,000 or more acres, so there will be virtually no net gain in productivity. At a cost of \$1,376 per acre, farmers will not pay for the actual costs of the irrigation water. It will rather be heavily subsidized by the federal government.² Yet the benefits of Garrison Diversion are even more dubious: in damming the Missouri, the communities and farmland of the Village Indians were completely flooded, forcing them to break up their towns and quit farming in their fields.

Economically, individual farmers and the region as a whole suffers. As individuals farmers are squeezed between the high costs of inputs, including machinery, fuel, fertilizers and pesticides, and the low prices paid for agricultural commodities. And as a group, farmers are constrained by the economic structure of agriculture, which favors the transition from many smaller farms to fewer but bigger ones. For instance, in 1930 there were 77,975 farms in North Dakota, but by 1978 just over half that number (41,172) remained.³ Dependent on extractive industries like conventional agriculture and mining, the region is especially vulnerable to fluctuations in commodity prices and government policies, over which people in the region have but fleeting control.⁴ The effects of these structural forces are felt most viscerally by farm families. As an indication of such social distress, there is no more grim statistic than suicide rates. During the 1980s, when low prices, falling land values, and droughts tragically coincided, over 900 farmers in the Upper Midwest took their own lives. This high rate of suicide, which in some years was nearly twice that of white men nationwide, was almost certainly linked to the financial ruin (i.e., the threat of losing the farm) facing many farmers.⁵

Sociologically, declining rural populations on the Plains has created difficult problems as well. Since 1930, more than one third of the counties in North Dakota have lost as much as half of their population;⁶ similarly drastic population loss has occurred across the region as a whole. As a result, there has been an ever-widening incongruity between the social and economic systems designed for dense populations—as in the humid east, or as the Plains formerly supported—and the sparse populations which remain. Put simply, when small populations are left to occupy a large area, the cost of maintaining the infrastructure (schools, highways, hospitals, etc.) falls on fewer people. Sociologists call this "the social cost of space," indicating one of the residual costs

of decreasing rural populations.⁷ Based on such declining demographic trends, Frank and Deborah Popper, a land-use planner and a geographer respectively, have argued that the Frontier has in this sense returned to the Plains, as well as the arid lands to the west. With low population densities, most of the northern Plains west of the 98th meridian would now qualify as frontier under historic definitions; that is, six people or fewer per square mile.⁸ For residents, living in the latter-day frontier means that rural communities are fewer and farther between, which in turn means that less off-farm jobs and social opportunities are available. As a sign in Alexander, North Dakota, reads, "Welcome to America's Outback." Located west of the ninety-eighth meridian, the sign is emblematic of the immensity of the semi-arid Plains and the ambivalence residents have for their futures there. Painted on both sides, the sign proclaims its message to those who are both coming and going, as though to say that in its current state the region and its problems cannot be left behind.

If people are to dwell long and harmoniously on the Plains, solutions to these problems need to be devised. Since the first task in solving problems is to understand them as fully as possible, I hardly need to reiterate the importance of understanding their historical development. To this end I try to grasp the complex way in which culture, history, and economics combined in the creation of Plains agriculture; I believe that efforts to revise agriculture as it is now conventionally practiced can be advanced by an understanding of how and why conventional agricultural systems were developed on the northern Plains. It has been my abiding hope that in knowing what the Plains has been—in all its cultural, ecological, and agricultural diversity—we might yet choose to make the Plains what it can best be.

¹ Tomer, Holzer, and Hockett, "A Case for Ground Water Management Through Cropping Strategies: Saline Seep Reclamation in Montana."

² Josephy, "Dr. Strangelove Builds a Canal."

³ Taylor, et al., Statistics of North Dakota Agriculture, p. 4.

⁴ Strange, et al., Half a Glass of Water: State Economic Development Policies and the Small Agricultural Communities of the Middle Border.

⁵ "Farmer Suicide Rate Higher in 1980s, Study Says", New York Times, 14 Oct. 1991.

⁶ Popper, Presentation at Concordia College, Moorhead MN, November 1990.

⁷ See A. H. Anderson, "Space as a Social Cost," Journal of Farm Economics, 33.3 (Aug. 1950): 411-430.

⁸ Popper, "The Strange Case of the Contemporary American Frontier," pp. 101-121.

Introduction

In his 1980 essay entitled "Solving for Pattern," Wendell Berry considers our inability to resolve agricultural problems *appropriately* as a manifestation of a deeper cultural problem, one having to do with how we conceptualize such problems in the first place. Narrow, partial or occluded definitions of agricultural problems, Berry maintains, produce correspondingly inept solutions. "To define an agricultural problem as if it were solely a problem of agriculture--or solely a problem of production or technology--is simply to misunderstand the problem," Berry insists. "The whole problem must be solved, not just some handily identifiable and simplifiable aspect of it."¹ Definitions of problems that are "either false or so narrow as to be virtually false" engender solutions that serve as mere palliatives, which do nothing about underlying causes, or multiply problems by spawning a series of unplanned ecological and cultural side-effects. For instance, "solving" productivity problems by mechanizing and relying on chemical fertilizers jeopardizes the community; farmers are replaced with machines and ground water is poisoned. Berry sees this dilemma, in which supposed solutions endanger the health of the community and land, as characteristic of our age; its "nature and gravity" are revealed in defense installations that threaten the defended, in medicines that cause sickness, in sanitation systems that pollute.²

In solving these dilemmas, Berry places little faith in what has been called scientific positivism and reductionism, which, greatly simplified, see entities in the world as atomized and discrete unless proven otherwise, and approach the study of phenomenon by progressively reducing the level of complexity involved. If positivism and reductionism frustrate the kind of analysis needed to solve for the pattern of problems in agriculture, as defined by Berry, then we need new ways of understanding agriculture (and by implication, society as a whole). Here Berry suggests that we think in terms of patterns. Like ecology, the kind of pattern-based thinking he recommends focuses on the web of relationships that lend coherency to otherwise disparate things, such as crops, landscapes, families, technology, and community. Ideally, pattern-based analysis can portray a problem within its environment, consider its wider implications, and provide enough detail and specificity to avoid vague generalities. Philosopher Albert Borgmann clarifies how pattern-based thinking (what he calls

"paradigmatic explanation") differs from reductionism. Whereas reductionism yields highly detailed knowledge regarding progressively circumscribed areas of inquiry, pattern-based thinking moves in the other direction, seeking instead to reveal the character of any given phenomenon by opening up the boundaries between that phenomenon and the world of which it is a part. Elucidating paradigms involves identifying the salient features of particular phenomena in relation to their concrete context(s).³

For Berry, patterns have value not only as a heuristic principle but also as a way of distinguishing between the character or quality of agricultural practices, a determination he makes on the basis of whether the patterns they embody are "healthy" or not. By his definition, healthy or proper patterns are to be found in balanced, reciprocal relationships between culture, agricultural practices, and the land. For instance, growing animals and crops together on the same farm may establish a reciprocal relationship that serves both; crops fed to livestock can later be returned as manure to fields, restoring nutrients and organic matter to the soil. To distinguish between health and sickness, Berry proposes a loose set of "critical standards." Ranging from accepting upward limits in scale to harmonizing with biological and cultural systems, these standards are also normative with regard to solutions to problems: with them Berry thinks "good" and "bad" solutions might be differentiated. Good solutions will thus contribute to the *health* of patterns. To clarify what he means by "health," Berry employs a telling analogy. A good solution will relate to a healthy pattern as an organ relates to a healthy body: the one does not confer health on the other—for they both partake in health together—and the sickness of the one is the sickness of the other. Taking the analogy a step further, Berry compares farmers and farms to organisms, and avers that "the endurance of this organism is a question about the sufficiency and integrity of a pattern," a pattern which he calls "organic."⁴

Whether or not one agrees with Berry's standards of judgement, his case for the need to look for patterns—before trying to solve them—remains cogent and compelling. With elaboration, it forms the basis of the following essay. However, rather than suggest standards of judgement (prescribing how the world *should* be), I have tried to describe how agricultural patterns on the northern Plains *came* to be. Admittedly, the ways in which I define such patterns—broadly speaking, by tracing the historical origins of social and ecological relations—stem from standards of judgement on my own part, including community viability and ecological sustainability. But I leave the

application of these concerns to be discussed and determined by society. In other words, the concerns Berry and I share, though cut of the same bough, are finally carved into different forms, reflecting our divergent purposes. Where Berry carves a yardstick by which culture and agriculture might be measured, albeit in a provisional manner, I carve a straight-edge with which points of interest, scattered across the geographic and historic landscape, might be connected. If these lines are properly drawn, as I hope to do, the patterns that have connected people, agriculture and the northern plains will become that much clearer.

In this essay I have thus attempted to write an ecological history of the changing agricultural patterns on the northern Plains.⁵ Spanning about 1830 to 1930, the broad scope of this history will cover the transition from Plains Indian agriculture and land-use practices to modern agriculture as practiced by white farmers. From such a long-term perspective, contrasts between agricultural systems are indeed striking, as I suggested in the Preface. But these contrasts obscure as much as they reveal, however. For as we shall see, there was much change within both Indian and white agriculture, and there were important continuities between them. From this perspective the multiplicity of agricultural patterns, not to mention their various ecological effects on the land, becomes as striking as the broad contrasts. Indeed, no set of binary oppositions can capture the diversity of motives and methods employed by the many cultures who have lived there, including Village Indians, nomadic tribes, fur traders, military units and miners, Bonanza farmers, reservation farmers, homesteaders, and modern farmers. All made their livings in the same general environment, and thus confronted certain shared conditions--namely, semi-aridity, short growing seasons and general unpredictability. But each group responded to these conditions in their own way, reflecting their respective cultures, economies, and technologies. As an ecological history this essay will explain how varying agricultural styles, and the social systems in which they were embedded, altered a single landscape. Obversely, I will examine the effect the land had on the people who settled there, relating changes in social systems and agricultural practices to the ecological exigencies all met on the northern Plains.

Accounting for the pace and degree of change in northern Plains agriculture requires a theoretical stance with wide applicability. Generally speaking, my approach will involve describing patterns as they existed in particular places and times, and then explaining how and why they arose. To describe agricultural systems I will employ pattern-based analysis; to explain

their historical development I will use a dialectical model of cultural ecology, to be spelled out shortly. Pattern-based analysis will proceed as follows. By Berry's definition, patterns are composed of all the aspects involved in farming, and constituted by the relationships formed between them. At the most general level, these aspects include culture, production practices, and the land. Yet each of these abstractions refers to a host of concrete phenomenon, like extended families, farms, fields, or cattle.

As a way of describing the world, pattern-based analysis entails characterizing the relationships between such concrete things. In contrast to deductive reasoning, which involves applying a set of formal laws or principles to actual occurrences, pattern-based thinking induces generalities from particulars. Importantly, the particulars involved are inherently situated in certain contexts--social, economic, ecological--which in part define their meaning in the world. For instance, to pedestrian tribes the horse was a radical technological innovation, implying new-found relations with their environment and other tribes. But to yeoman farmers about to buy tractors, horses were seen as the most traditional of technologies, implying a conservative orientation toward the world in general and agricultural innovations in particular. Put simply, to understand the various factors involved in agriculture, and the patterns they form, the contexts in which they exist must be characterized.

Although it widens our frame of reference through space, pattern-based analysis needs to be complemented with a way of accounting for how these factors evolve through time, lest it appear that patterns of agriculture effect their environment in a static or simply linear fashion. Indeed, societies and ecological communities alter environments appreciably, and occasionally in unpredicted or unpredictable ways. In his Changes in the Land, William Cronon depicts how the *instability* of relationships between human and natural communities can be used to explain historical transformations in both. By focusing on instability within cultures and ecosystems, as well as on the interactions between the two, Cronon avoids viewing either in terms of homeostatic equilibrium. Instead, Cronon develops a model of cultural ecology whereby nature-culture interactions are seen as mutually-unfolding and responsive: as a culture conceives of natural resources and limitations in its peculiar way, they alter landscapes accordingly, creating a new range of resources to which both culture and nature might respond. From this perspective culture and nature can be seen as interacting dialectically, each creating conditions to which the other responds.⁶ Such

dynamic relations are not easy to characterize; many levels of society, groups within a society, and relations between societies are involved. For the sake of simplicity, the range of factors may be categorized, as Arthur McEvoy has done, in terms of ecology, production and cognition. Based on the "crucial fact" that the mental and physical lives of humans are "embedded" in each other and in the natural world, McEvoy forms the dialectic thusly: "all three elements, ecology, production and cognition, evolve in tandem; each partly according to its own particular logic and partly in response to changes in the other two."⁷

Dialectical relationships are particularly evident in agriculture, since the virtual definition of agriculture is that humans have somehow changed "natural" landscapes for the purpose of producing foods and fibers. In the very act of farming, be it clearing away a patch of undergrowth, felling trees to create an open field, or plowing the prairie, people thus introduce at least a degree of instability into their relationship with the altered environment. Once started, such disturbances can follow a number of trajectories, ranging from incidental and unguarded plantings, to cyclical or swidden maintenance of fallowed clearings in the forest, or to larger-scale alterations of landscapes. But in every case, the initial alteration of the land presents would-be farmers with a new environment, to which they might variously respond. Unless one assumes that the ensuing relationship between peoples' perception of the land, their production activities, and the resulting ecological changes are determined by some unvarying logic, agriculture can be seen as involving a series of inter-related alterations and adjustments between people and land.

As such I follow in this essay the dialectical interactions between ecology, production, and cognition, however they have been individually constituted and collectively constellated on the northern Plains. At the outset, the categories of ecology, production, and cognition must be clarified. Broadly speaking, by "ecology" I mean the northern Plains ecosystem. The ecological factors therein may be divided into two categories, based on their scale and origin. The first category includes those natural phenomena which occur so slowly or over so vast an area as to be imperceptible to a person in his or her lifetime. Including geological processes, climatic change, and biological evolution, these phenomena created the conditions under which all life on the Plains exists. Such benchmarks in nature's history are dimly known to most, having occurred over the course of thousands if not millions of years—long before humans were around to witness (much less record) them. But as will be made abundantly clear, they have

nonetheless left their indelible imprint on the lives of past and present inhabitants. Of more immediate interest to humans, though hardly any better understood, are those processes and events that occur within an individual's lifetime. Germination of seed, growth of grass, grazing by animals, migration of birds and animals, ecological succession and cycles of the seasons, as well as fires, grasshopper plagues, bitter winters, distribution of water and wood, and droughts have alternately blessed and broken those who have tried to farm on the Plains. These and other natural conditions constitute the ecological context of Plains agriculture.

Production includes all the relations of production—social, economic and technological—which in some way are brought to bear on the land. As far as production is concerned, social relations involve such factors as the geographic distribution of people, the way communities are formed, divisions of labor, and the existence and nature of hierarchy. Obviously societies constitute their social relations differently, and these differences affect how and why a given society relates to its environment. From the perspective of economics, production is the first stage in the production, distribution, and consumption of goods and services. But here economics as a discipline may not be an adequate guide, for the substantive nature of economic activity, as opposed to the formal principles of economic theory, varies in different cultural and historical settings. Thus, to understand the role of production in a society's agricultural ecology, one must demonstrate how the structure of production, distribution, and consumption relate to agricultural practices. Technology obviously plays a major role in production. In common parlance "technology" is simply equated with tools, but for my purposes its meaning will be expanded. In addition to tools *per se*, technology involves the way tools and techniques structure peoples' interaction with the world and each other. In this sense technology can be seen as creating "forms of life," in Langdon Winner's phrase.⁸ If technology is understood as a form of life, and not simply as discrete instruments, it follows that technological development and diffusion can change social and even political arrangements. The history of Plains land use is replete with examples of how technologies can alter peoples' social and ecological relations, the most striking examples of which include horses (as mentioned earlier), railroads, and combines.

The outlines of cognition are inherently less well defined than those of ecology or production, but its role is no less keenly felt. Cognition includes a peoples' perceptions of the land, economics, and of themselves. In some ways,

the way people see the natural world depends as much on their cultural, religious and philosophic training or background as it does on the "objective," physical world itself. Additionally, material interests, individual idiosyncrasies, and learning color peoples' perceptions in varying degrees. Obviously the various groups who lived there regarded the Plains environment in their own unique ways but, just as importantly, such perceptions set the parameters on how those people responded to and made a living in the region. In addition, different peoples' perception of the Plains changed in time. Was that vast expanse, for instance, a desert or a garden? As we will see, each estimation implied different approaches to settling the Plains. Beyond their views of the land, peoples' perceptions with regard to agriculture, community, and economics also conditioned agricultural development on the Plains. Cultural perceptions, relations of production, and ecological conditions all affect and in turn are affected by changes in culture, agriculture, and the land.

This essay will be organized as follows. In Chapter 1 I describe the nature of the northern Plains, defining the climatic, geological, and ecological contexts of agriculture there. In Chapter 2 I relate the socioeconomic relations of the Village Indians to their land use practices. As I discuss in Chapter 3, these land use practices were connected to a larger economic system and were not static through time. I briefly suggest in Chapter 4 some of the basic differences between how Indians and whites perceived the land, and their first forms of agriculture, as they were practiced by fur trappers, miners, and soldiers. I address in Chapter 5 the early industrialization of Plains agriculture, and chart its impacts in the form of Bonanza farming, buffalo hunting, and cattle ranching. Homesteading is the subject of Chapter 6. In Chapter 7, I cover how the Dawes Act of 1889 wrought socioeconomic changes in reservation agriculture. And lastly, I conclude in Chapter 8 by examining the Dust Bowl of the 1930s and the related demographic desertion of the Plains.

¹ Berry, The Gift of Good Land, p. 136.

² Berry, p. 134.

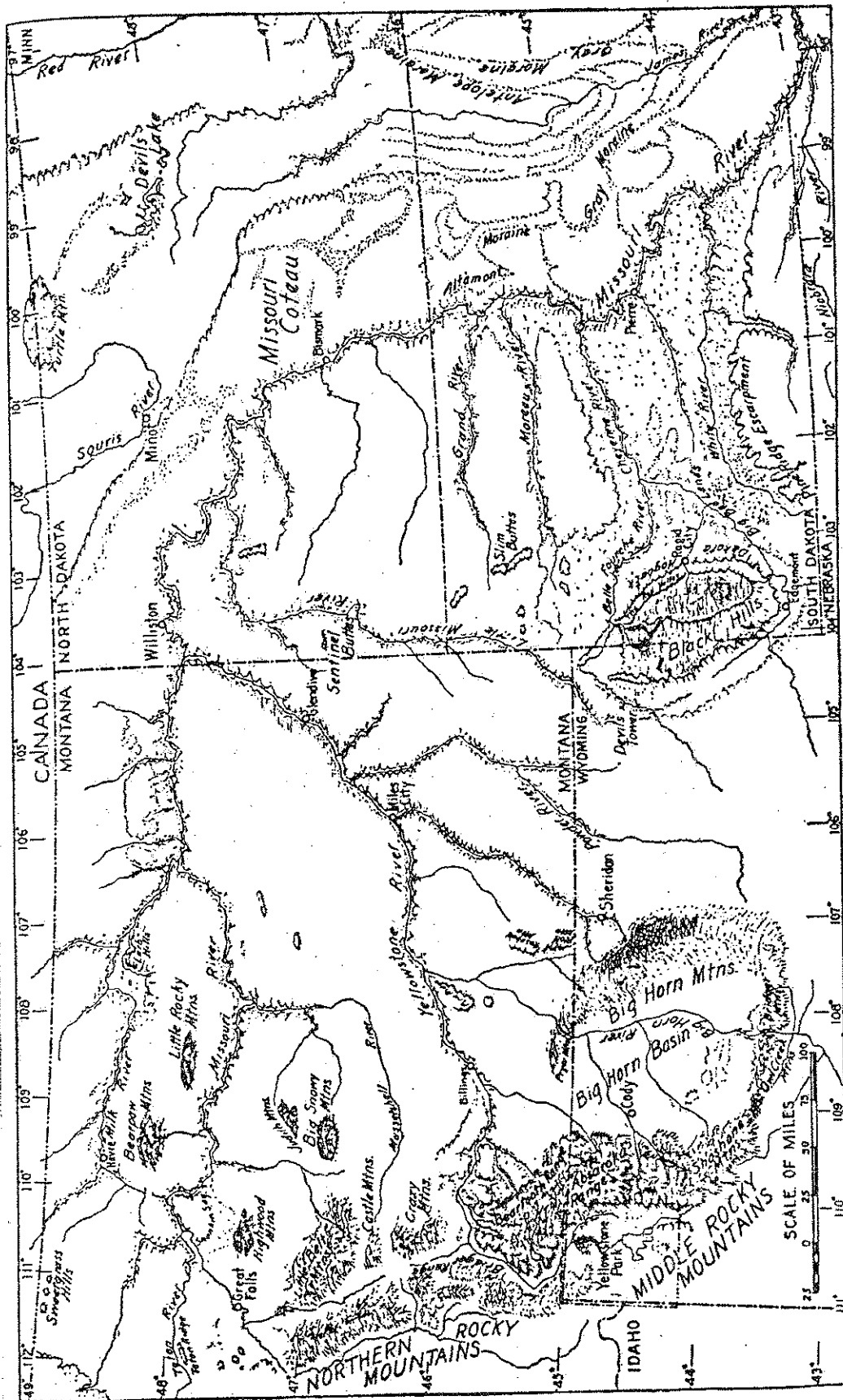
³ Borgmann, Technology and the Character of Contemporary Society.

⁴ Berry, p. 143.

⁵ For the purposes of this study the northern Plains will include northern Nebraska, South and North Dakota, eastern Montana, and northeastern Wyoming.

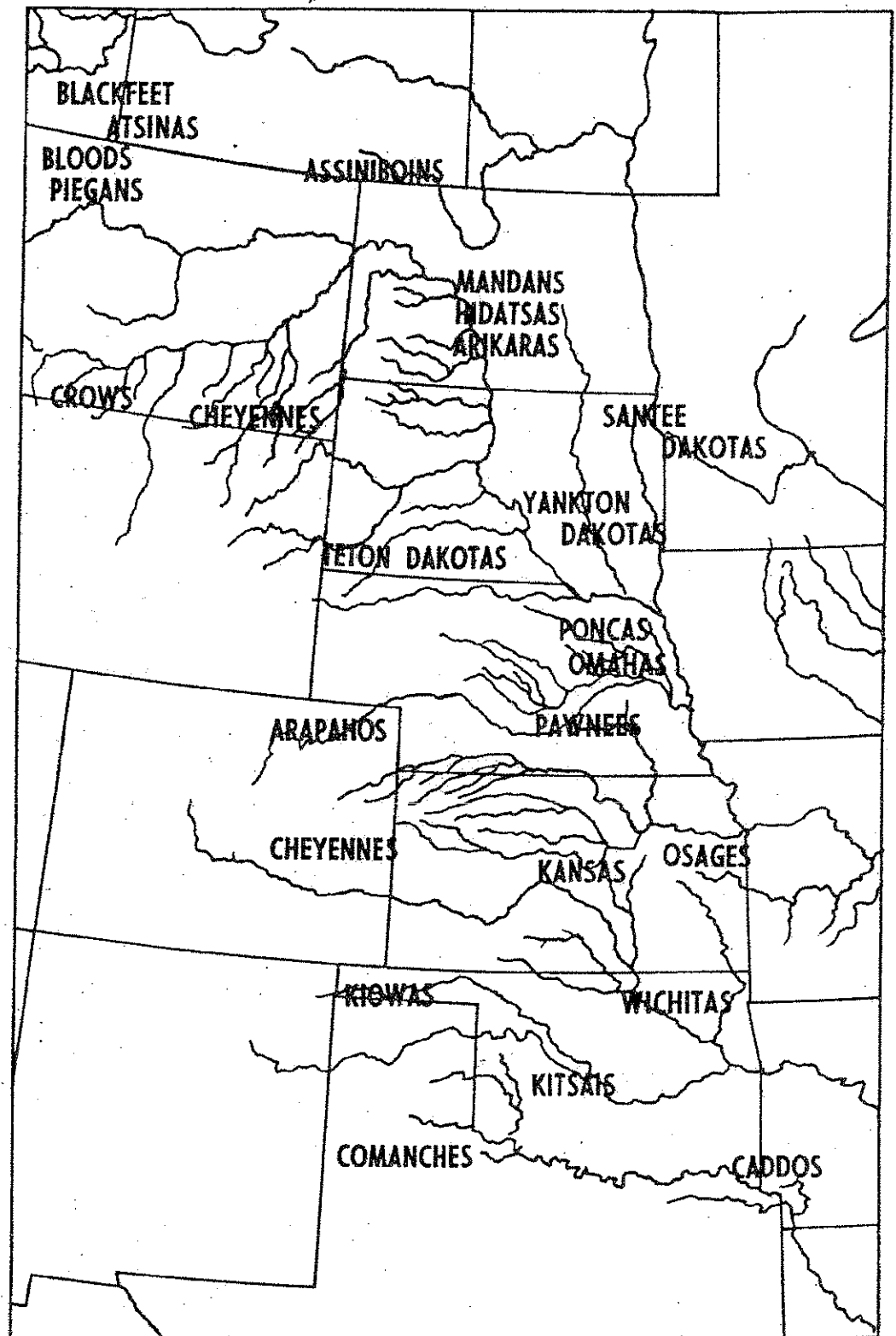
⁶ Cronon, Changes in the Land.

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- ⁷ McEvoy, "Toward an Interactive Theory of Nature and Culture: Ecology, Production and Cognition in the California Fishing Industry," p. 229.
- ⁸ Winner, The Whale and the Reactor, p. 11.



(Drawn by Guy-Harold Smith.)

As Copied from Mary Hargreaves, Dry Farming on the Northern Plains, Cambridge, MA:
1957



As copied from Preston Holder, The Hoe and the Horse on the Plains,
(Lincoln, NE: University of Nebraska Press, 1970).

The Paradoxical Plains

In 1832 George Catlin boarded a steamship in St Louis. He was bound for the Ft. Union trading post, located hundreds of miles up the Missouri River at the mouth of the Yellowstone. As a romantic artist, Catlin sought to capture the unadulterated character of Indians in his paintings and letters. His descriptions, though inflected with sentiment about what he called "nature's noblemen," offer a panoramic view of the land and lifeways on the upper Missouri. Eighteen hundred miles upriver from St. Louis he first saw the Mandan villages. Perhaps alluding to the legendary Seven Cities of Gold, for which Coronado had in vain searched the southern Plains in the 1500s, Catlin contrasted the village with European notions of wealth: "On an extensive plain... are to be seen rising from the ground, and towards the heavens, domes--(not "of gold," but) of dirt--and the thousand spears (not "spires") and scalp-poles, etc, of the semisubterraneous village of the hospitable and gentlemanly Mandans." The village may not have had gilded roofs but it did have ditches, walls, and commanding locations, not unlike a castle. Catlin noted that its placement "was admirably suited for defense; being on a bank forty or fifty feet above the bed of the river." Flanked by steep walls on two sides, the village had "but one side to protect, which is effectually done by a strong piquet and a ditch inside of it, three or four feet in depth."

Within its walls, Catlin reported that "their lodges are closely grouped together, leaving but just room enough for walking and riding between them.¹ However, "in the centre of the village," Catlin observed that there "is an open space, or public area, of 150 feet in diameter, and circular form, which is used for all public games and rituals, shews [sic] and exhibitions; and also for their 'annual religious ceremonies.'" The earthlodges themselves "have circular form, and are from forty to sixty feet in diameter," Catlin wrote. Supported by logs, the earthlodges were covered with mud. "In the centre [of the lodge]," Catlin described, "and immediately under the sky light, is the fireplace--a hole of four or five feet in diameter, of circular form, sunk a foot or more below the surface, and curbed around with stone. Over the fire place, and suspended from the apex of diverging props or poles, is generally seen the pot or kettle...."

Catlin was invited by Mah-to-toh-pa, a Mandan chief, to partake in a meal around one of these hearths. As a host Mah-to-toh-pa was "free, generous,

elegant and gentlemanly in his deportment," said Catlin, not to mention "handsome, brave and valiant." Pictographs of his successes in battle were "emblazoned" on the back of the robe he wore. These would have "filled a book of themselves, if properly translated," Catlin mused.² Mah-to-toh-pa offered Catlin a feast consisting of three dishes: pemmican (dried meat ground together with dried berries and marrow fat), buffalo ribs, and a kind of pudding made from the "pomme blanche," which, as Catlin noted, was "a delicious turnip of the prairie." Before eating Mah-to-toh-pa ceremonially smoked a pipe, sacrificed some food as an offering, and smoked again after they had finished eating. As Catlin was about to leave, Mah-to-toh-pa had him stand up, and then he gave Catlin the buffalo robe on which he had been sitting. By way of explanation, Mah-to-toh-pa said that he had made the robe as a gift specially for Catlin. On it Mah-to-toh-pa had painted more scenes of his successes in battle (the stories of which Catlin later recorded).

Through the course of the meal and the rest of his stay, Catlin was exposed to the social organization, economics, and landscape in which the Village Indians lived. Though Mah-to-toh-pah did not offer him food which the Mandans had grown in their gardens, Catlin nevertheless knew that they were "some what of agriculturalists, as they raise a great deal of corn and some pumpkins and squashes." All the agricultural work was done by the women, Catlin observed, "who make their hoes of the shoulder-blade of the buffalo or the elk, and dig the ground over, instead of ploughing it, which is consequently done with a vast deal of labor." Catlin noted also that the corn grown by Mandans, smaller than varieties grown in the east, was "well adapted to their climate, as it ripens sooner than other varieties, which would not mature in so cold a latitude." All the corn not eaten during harvest or green corn festivals was, Catlin reported, "gathered and dried on the cob, before it has ripened, and packed away in 'caches,' (as the French call them), holes dug in the ground, some six or seven feet deep, the insides of which are somewhat in the form of a rug, and tightly closed at the top." In addition to storing corn, Catlin saw the Mandans store "great quantities of dried squashes and dried 'pomme blanches' as well as dried buffalo berries, service berries, strawberries and plums."³

The Villagers did indeed rely on their crops for their subsistence, and traded them extensively between tribes. In 1784 David Thompson, an agent for the Hudson's Bay Company stationed near Lake Winnipeg, traveled overland to the Mandans. "They at present, as perhaps they have always done, subsist

mostly on the produce of their agriculture," Thompson observed, "and hunt bison and deer, when these animals are near them." In describing their crops, Thompson specified that "the produce they raise is mostly maize (Indian corn) of the small red kind, with other varieties all of which come to perfection, with pumpkins and a variety of small beans. Melons have been raised to their full size and flavor." Thompson was impressed with not only the productivity of the gardens but also the general appearance: "Every article seen in their village was in good clean order." Thompson could not in fact reconcile the presence of abundant crops with what he saw as the Indians' lack of iron: "The want of iron limits their industry; yet they raise not only enough for themselves, but also for trade with their neighbors." He presumed that without iron, no level of comfort or civilization could be achieved. But he learned better. Having brought "goods and trinkets" with which to trade for some of the Villagers' fresh produce—a scarce item of food back at the trading post—Thompson happily reported that "we brought away upwards of 300 pounds of weight [of crops]."⁴

In July of 1806, Alexander Henry similarly traveled overland to the villages from the fur trading post which was establishing where the Pembina flows into the Red River. Henry was particularly interested in how the Villagers farmed, since as a part of establishing his trading post, he too was trying to garden, which, as he was learning, was no easy task in the short-seasons and semiaridity of the northern Plains. Though he did not say so, Henry must have compared the Villagers' established agriculture to his own incipient gardening. Apparently he was favorably impressed. "We passed extensive fields of corn, beans, squashes, and sunflowers," wrote Henry, "many women and children were already employed in clearing and hoeing their plantations. Their hoes are the shoulder blade of a buffalo, to which is fastened a crooked stick for a handle"—and clarifying the dilemma posed a dozen years earlier by Thompson, Henry observed that—"the soil not being stony, this slight implement answers every purpose." Riding along the Missouri on horseback, Henry provided an overall impression of the place: "Upon each side were pleasant cultivated spots, some of which stretched up the rising ground on our left whilst on our right they ran nearly to the Missouri. In those fields were many women and children at work, who all appeared industrious.... The whole view was agreeable, and had more the appearance of a country inhabited by a civilized nation than by a set of savages."⁵

In some ways whites like Catlin or Henry were predisposed to identify with the Villagers. With their settled agriculture in wooded valleys, the Villagers were about the only familiar things in an utterly alien land. For both the Plains proper and the nomadic tribes who lived there were unlike anything whites had ever seen. To whites, the Sioux, Assiniboine, Crow, and Blackfoot seemed to search endlessly on horses for buffalo, traipsing across the exposed plains without property tying them to the land. Perhaps most bewildering, nomads had a minimum of possessions but a maximum of prowess. Even if white men identified with the avowedly male orientation among the nomads, associated as it was with hunting and warfare, they could scarcely appreciate the nomads' spiritual ties to the land, social system within bands, or history. For this reason many whites, seeking respite after making the journey across the plains or up the Missouri, seem to have uttered a sigh of relief upon reaching the villages. Not that they were really "at home" there, for much about the villages baffled whites, including their religious rites, divisions of property and labor, systems of land tenure, the status of women, and the primacy of community. But compared to the Plains and nomads, the rivers and the Villagers seemed strangely familiar, habitable, and, given the Villagers' welcome, even hospitable.

The Missouri River Valley was what ethno-historian Roy Meyer has called an "elongated oasis," supporting trees and agriculture in an otherwise semi-arid region.⁶ With dependable water, protection from desiccating winds, and a high water table,⁷ the Missouri Valley seemed to early whites as a valley of plenty amidst a vast plain of scarcity. For instance, Pierre Tabeau, who in 1800 was accompanying a party of men trying to establish a fur trading post, said of the fruit-bearing bushes growing along the Upper Missouri that "although the kinds be few, each kind yields abundantly. The choke cherry, the currant and the plum fill the valleys and border the streams."⁸ Tabeau also encountered the buffalo berry, an indigenous bush Lewis and Clark would scientifically describe six years later.⁹ For hundreds of miles miles they grew, he found, on "both banks of the Missouri and all these lands from the village of the Poncas up to the Mandans...."¹⁰ Catlin too was particularly impressed with buffalo berries, which, as he observed, "forms a striking contrast to the rest of the foliage, from the blue appearance of its leaves." Confirming Tabeau's reports regarding their abundance, Catlin said the buffalo berries grew so quickly as to create "almost impassable hedges, so loaded with the weight of their fruit, that their boughs were everywhere gracefully bending down and resting on the ground."¹¹

Moreover, in the valleys were to be found cotton wood and green ash trees, not to mention water and shelter from incessant, desiccating winds.

The implications of these observations were clear: only where wood, water and shelter were available could living be secure—at least in the way whites were accustomed to living. And across most of the region, these crucial resources were to be reliably found only in river valleys. Yet whites also noted that the Missouri River Valley was not always and everywhere a sure supply of wood and shelter. Indeed, the distribution of trees was variable, even unpredictable. Thus on the same trip Catlin took to the Yellowstone, his party had to travel a considerable distance before they could find enough wood with which to cook an antelope. They finally found "immense quantities of raft and drift wood" piled on an island. Along approximately the same stretch of the Missouri, Lewis and Clark had earlier faced a similar problem: the irregular distribution of large cottonwood trees from which they needed to carve the canoes that would take them to the headwaters of the Missouri. The expedition was lucky, and found the trees only ten miles north of the Mandan villages, but expeditions in different sections of the Missouri had not been so fortunate.¹²

Jean Baptiste Trudeau, on the other hand, was not so lucky. In 1795, he was trying to haul trade goods from the Arikara villages upstream to the Mandans. His men spent two weeks, traveling seventy five miles north of the Arikara villages, but could not find any trees big enough. For 125 miles north and south of the Arikara villages, Trudeau surmised, "the country is composed of hills and prairies, with an occasional patch of woods, the trees being willows and short and slender cottonwoods." As a result of the sparse distribution of trees, Trudeau noted, the Arikara used mostly drift wood, emphasizing an important ecological difference between the location of the Arikara and Mandan Villages, as we shall see. But to Trudeau the paucity of trees meant something else: "It would be most difficult," he lamented, "for us to construct either houses or forts in this locality; we would need many people and much time to succeed."¹³ Apparently it did not occur to Trudeau that he or his white contemporaries could adapt their architectural styles, resource use, or settlement patterns to the conditions of scarcity they met on the Plains. In this regard, Trudeau's thinking presaged the way most whites later confronted the uniquely challenging conditions on the Plains.

Once beyond the riverine corridors, however, whites found little with which they could identify—especially trees. As the first white man to travel to the

Villagers, Pierre Gaultier LaVerendrye confronted the lack of trees on the Plains as early as 1738, and duly noted how his Assiniboine guides dealt with the scarcity: "They even make the dogs carry wood for fires, frequently being obliged to camp in the open prairie, where the islands of timber are distant from each other."¹⁴ Almost one hundred years later Catlin similarly distinguished between the river valleys and the plains around them: "From St. Louis to the falls of the Missouri [i.e., the Great Falls], a distance of 2600 miles, is one continued prairie," but then Catlin added, "with the exception of the bottoms formed along the banks of the river, and the streams which are falling into it, which are often covered with the most luxuriant growth of forest timber."¹⁵ It should come as no surprise, then, that white descriptions of the northern Plains tended to bifurcate the region along the lines delineated by rivers. These observations were accurate in that they identified two basic ecological zones on the Plains, exposed uplands and wooded rivers. Yet the stark, almost Manichean contrast overshadowed the ecological processes that joined the two zones, processes which are evident from an ecological understanding of the region as a whole.

Indeed, the difference between Plains and rivers was by no means the only important ecological factor which whites encountered—or to which Indians had variously adapted. Equally important, though not so dramatic, were more subtle ecological interactions, such as the distribution of plants according to varying rainfall, the characteristics of grasses, or the function of disturbance. Such interactions constituted the grasslands ecosystem, and serve to explain how the distribution and abundance of species relates to regional patterns of climate and landforms, as well as local events like weather or fires. Explorers often confronted the consequences of these processes—in the form of shortages of wood, fires, or the movements of animals—and many of their observations contain detailed descriptions of them. Descriptions of bison, prairie dogs, or fires—as well as the effects each had on the land—figure prominently in their accounts. But few at the time understood what such interactions might mean.

The reason why seems obvious enough: as a landscape, the Plains was wholly foreign to whites' experience, and so they simply did not know how to think about it. Having never lived in grasslands, whites were unschooled in its characteristics, ecological and otherwise.¹⁶ Facing that expanse, almost all were awe-struck and angst-ridden. By far, flatness, dryness, and lack of trees were its most impressive features, features which contradicted Europeans' long-inherited and deeply-held sense of what arable and liveable landscapes are like. To

varying degrees they were thus confounded by the Plains; some like Catlin were curious, fascinated by its strangeness, others were prone to castigate the region for its apparent worthlessness, but most were just plain hesitant, loathe to tread where they were exposed to so many uncertainties and open to so many vulnerabilities.

As a result of these varying responses, conflicting reports regarding the area began circulating, starting a prolonged and at times acrimonious debate about how the land was to be understood. Explorers searched for metaphors to convey the feeling which the regions' flatness, dryness, and lack of trees evoked; many grasped at "desert," a landscape which to them shared these features. For instance, after the Lewis and Clark expedition had passed the mouth of the Yellowstone, where the Fort Union trading post would later be located, two of its members voiced discouraging words regarding not only the land but also its agricultural potential. An otherwise unidentified member named Whitehouse wrote that he thought "it too much of a desert to be inhabited, or cultivated." Similarly, Ordway considered it good for nothing but game, and thought that it might "with propriety be called the Deserts of the North America for I don't conceive any part of it can ever be sited as it is defficient of or in water except this river."¹⁷

Not all observers took a dim view of the Plains, however. Catlin, characteristically enough, was ebullient with regard to the plains, or what he referred to as "the wide expanded meadows, with their long, waving grass, enameled with myriads of wild flowers." In a similar vein, Lewis and Clark, whose more scientific observations had greater sway in shaping public attitudes about the region, had a high estimation of the plains' potential, as Lewis indicated when he wrote,

This immense river, so far as we have yet ascended, waters one of the fairest portions of the globe, nor do I believe there is in the universe a similar extent of country equally fertile, well watered, and intersected by such a number of navigable streams.... From various information I had been led to believe that it was barren, sterile, and sandy; but on the contrary I found it fertile in the extreme, the soil being from one to twenty feet in depth, consisting of fine black loam, intermixed with sufficient quantity of sand only to induce a luxuriant growth of grass and other vegetable productions.¹⁸

However, with the exceptions of Catlin and Lewis and Clark, most Americans thought poorly of the Plains, emphasizing in their descriptions what it lacked, namely, wood, water, and shelter. Instead of describing it on its own terms, these descriptions focused on what it was not, i.e., a humid forest. Besides grass, bison herds, and prairie dogs, they thought little else was there. For instance, Sarah Canfield voiced such a negative estimation of the Plains as she traveled up the Missouri in 1867. As she peered at the plains from the deck of a steamship, she scowled, "this is a worse country than I ever dreamed of. Nothing but hills of dry sand, with little streaks of short shriveled grass in the hollows and on the river bottoms."¹⁹ As a desert that lacked obvious landmarks to fix their attention—or, as we shall see, to delineate property boundaries—many whites felt as though the region was an undifferentiated expanse, varying but slightly over great distances.²⁰ In this vein Philippe Regis de Trobriand, a French officer with U. S. Cavalry who in the 1860s was stationed in Dakota Territory, remarked as he and his unit traveled on horseback across the plains: "We are really out in the desert. In every direction, the eye ranges across empty space, the edge of which is lost in the heat of the sun and is merged with the sky."²¹ But the deficiency, as James Malin quipped, "was in the mind of forest man and not in the grassland."²²

From the perspective of the explorers' accounts, the northern Plains was seen as a landscape of utter monotony punctuated by occasional spectacles, like buffalo herds and fires. To the extent their observations of such spectacles went unexplained, and were inflected with the hyperbole of discovery, the Plains appeared to most Americans as a panorama of the bizarre. In this way explorers on the Plains saw much but understood little. However, with their unobstructed view of the land, explorers thought that everything laying in front of them was at once revealed to them. But in retrospect the nature of the Plains was more elusive than that. William Last Heat Moon has captured this paradoxical feature of the Plains. "The prairie," he observes, "is not a topography that shows its all but rather a vastly exposed place of concealment."²³ To understand the nature of the northern Plains, then, we must appreciate the enigmatic ecology of a temperate grassland.²⁴

Ecological conditions on the Plains are determined in large part by geological processes and climatic patterns which occur over extended ranges and lengths of time. Briefly recapitulating the natural history of the landscape will

explain why it has its peculiar features. The environment known today as the Plains was a long time in forming. Over the course of its long natural history, the Plains has been a kind of *tabula rasa* on which various natural processes have inscribed numerous forms of landscape, the outlines of which are disclosed to us today by interpreting the geological record of rocks, fossils, and pollen cores. This record of past events suggests that only from the myopic perspective of the present does the plains landscape appear to be static. From the perspective of its long natural history, great dynamism appears as the norm from which relatively momentary stasis diverges. These natural processes are composed of geological changes occurring across the continent, climatic vacillations, and biological evolution and diffusion. Of these, three are particularly relevant here, for they all contributed to form essential features of the historic Plains. These include, in chronological order, the fall of the continental sea and the rise of the Rockies, the coevolution of grasslands and grazing animals, and most recently, waves of glaciation and the colonization and extinction of various species, including humans. From the perspective of these larger patterns, the Plains will seem not so bizarre after all. Nor will the area appear as a static, unchanging landscape. Indeed, from the perspective of natural history, the region has undergone many and great changes, the legacy of which we know today as a flat, temperate, and semiarid landscape. These general conditions form the parameters within which and the resources with which natural communities and human societies on the Plains must somehow live.

The beginning of the Plains as we know it starts at the end of the Cretaceous, a geological period which lasted approximately from 140 to 65 million years ago. During the Cretaceous, a broad, shallow sea covered much of the interior of North America. Extending from the Gulf of Mexico to the Arctic Ocean, this inland sea was more or less contiguous with the outlines of the modern Plains. Geologically, the sea was a depositional basin in which sediments eroded from higher elevations as well as detritus from the sea itself accumulated. Rich in calcium and other nutrients, such detritus formed the parent material out of which rich prairie soils were made. In the distant future, these layers of sediment would form the bedrock below the sod and soil. Around the sea's swampy edges, organic-rich forests grew and decayed, the compressed remnants of which are to be found today in layers of coal. At the end of the Cretaceous, changes in the earth's climate and the size of its land masses

effectively lowered the inland sea--and thereby drained North America. These world-wide climatic changes indirectly caused massive extinctions of life forms associated with Cretaceous environments, like the inland sea, which explains in part why bison, and not dolphin-like mosasaurs, roamed the historic Plains.

The Rockies rose after the inland sea fell. Owing to the rising Rockies the vast and relatively flat sea-floor had higher elevations along its western periphery. As a consequence, most rivers ran (and still do today) from west to east down this extended erosional surface, stripping away sediments that were previously deposited on the bottom of the inland sea. In addition to changing the lay of the land, the Rockies altered the region's climate in a crucial way: the Rockies interrupted the movement of humid air from the Pacific to the continental interior. The Plains, not surprisingly, dried out, leaving its humid-adapted plant communities high and dry. In effect, the rise of the Rockies had created a new ecological niche--the semiarid flatlands--into which the characteristic flora of the plains, the grasses, would eventually diffuse.

Glaciation was the last major event to appreciably alter the lay of the land. Glaciers proceeded in several successive waves, the last of which occurred as recently as 12,000 years ago. As they plodded southward, glaciers roiled as well as flattened the surface of the land. Since glaciers completely covered only the northern tier of the region, southern areas were left with varying topographies, depending on the extent and frequency of glaciation that they did undergo. These areas still bear the mark of their glaciation. Along the eastern border of the region, now known as the Red River Valley, glaciers created a long, flat region. Upon their retreat, this area filled with Lake Agassiz, a sort of mini-inland sea. Across the middle of the region, the glaciers transgressed southward and receded northward in an accordion-like fashion, leaving a broad band of gouged-out depressions, now known as the prairie pothole region. West and south of the Missouri, in a region called the Missouri Coteau, was for the most part unglaciated, and thus has more hills and fewer pot-holes than other areas.

As a result of glaciation, mountain building, and ocean deposition, the resulting landscape was in the main flat, semi-arid, and treeless, features which have ever since loomed large in geographical descriptions of the region.²⁵ However, the Plains is not so much a flat monotony as it is subtly variegated. And as we shall see, slight variations in topography and soil distributions make a great difference with respect to local ecological conditions, conditions which

affected not only the distribution and abundance of wild plants and animals but also land-use patterns and settlement distributions.

The region's climate is continental. Since the northern Plains is in the northern latitudes, but is bordered by no large bodies of water which would act to moderate climate, it is subject to extreme seasonal variations. Not infrequently, temperatures are as high as 100° in the summer and as low as -25° in the winter. Even more important to farmers are the length of the growing season and amount of rainfall, for both are minimal to agriculture. What's more, they are highly variable, and therefore especially unpredictable. With an average of only 100 frost-free days—a length often regarded as the shortest season in which farming can be successfully attempted—the region has a short growing season; with infamous frosts in May and September, the region has an unpredictable growing season. For rain, the Plains receives less than twenty inches a year, a level which is as marginal as the growing season. But even low average amounts of rainfall do not portray actual rainfall patterns, for what little rain the Plains does get comes sporadically. During any given year areas may receive much more or less than long-term averages, and so it is unlikely that any place will, on average, receive twenty inches every year.

If explorers lamented the lack of trees on the Plains, they could not bemoan any dearth of grass. For it was everywhere. Grass is in fact the dominant kind of vegetation there, a fact that has lead prairie ecologist O. J. Reichman to observe that the biology of grasslands is essentially the biology of grasses. As the dominant component of grassland ecosystems, the habits, productivity, life cycles, and ecology of grasses form in large part the foundation on which other organisms live.²⁶ Grasses dominate the Plains because they are uniquely adapted to withstand drought, fire, and grazing. These three factors, characteristic of grasslands, are hazards to plant growth insofar as they remove some or all of a plant's leaves and stems. Unlike that of other flowering plants, the physiological point from which grasses grow is located below ground. For this reason grasses thrive on the Plains because they can readily grow back after fire, grazing, or drought removes their aboveground parts—whereas most dicots are vulnerable to such "degradations", as Reichman calls them.²⁷

Grass was the main component of the grassland ecosystem but that grass, like the distribution of trees, was not always and everywhere the same. Within the Plains, variations in the kinds, distribution, and abundance of grasses were marked, reflecting long-term precipitation patterns. Rainfall is higher along the

eastern fringe of the Plains. As one moves westward, where drier air coming from either the southern Plains or over the Rockies dominates local weather, rain is both less abundant and dependable.²⁸ Between these two extremes all degrees of variation occur. Yet for convenience, the 98th meridian, which bifurcates the region on a north-south axis, marks a critical boundary with respect to rain: the prairies to the east of it usually receive more than twenty inches of rain a year, whereas the Plains to the west of it seldom receives more than twenty inches. In ecological terms, the Plains' east to west pattern of rainfall distribution constitutes an environmental gradient on a continental scale. As such, the distribution of grasses can be correlated to rainfall: moving from east to west, one passes first through the tall grass prairies, located in Iowa and the eastern Dakotas, Nebraska, and Kansas, then through the mixed grass plains, extending from the tall grass prairies to the western side of the Dakotas, Nebraska, and Kansas, and finally reaching the short grass plains, throughout eastern Montana and Wyoming.

The tall grass prairies are perhaps the best known of the three, owing to the legendary height of their chief species: Big Bluestem, Cordgrass, and Reed Canary Grass. Standing as high as ten feet, these grasses seemed to swallow men—even on horseback. In addition, Indian Grass and Switch Grass are common tall grasses on the northern Plains. The range of the tall grasses extends on the drier Plains in such moist habitats as potholes, rivers, and depressions. But on the drier ground, mixed grasses like June Grass, Needlegrass, or Needle and Thread predominate. Standing one to two feet tall, the mixed grasses include a great variety of species, cover a wide range of habitats, and exhibit many adaptations to them. For instance, Green Needlegrass and Sanddropseed prefer sandy soils whereas western Wheatgrass grows best in heavy clay or loam soils. As a way of increasing the success of its seeds, Needle and Thread has sharp pointed seeds and awns (a bristle on the seed) which twist as they dry. After falling to the ground, Needle and Thread literally plants itself—the twisting awns bore its seeds one to three inches into the soil.

The range of mixed grasses was extended westward, like that of tall grasses, by such abnormally moist habitats as potholes, rivers, and depressions. But there the short grasses predominate, ranging in height from about six to twelve inches, the short grasses include Buffalo Grass, Blue Grama, Side Oats Grama, and Red Three Awn. Especially tolerant to drought and low rainfall generally, short grasses form a dense mat of vegetation when rain falls but are

sparse when it doesn't. Buffalo Grass, for instance, sends out runners which, under good conditions, can grow one half to two inches a day. Like their mixed and tall analogues, the short grasses had diverse characteristics. Unlike Buffalo Grass, Blue Grama reproduces by seeds and can grow in fine sand or silt. As its name suggests, Red Three Awn has three prominent awns, for which it is also named Wire Grass and Ticklegrass. The distribution of short grasses stretched from the Rockies to the mixed grass and, as with mixed and tall grasses, extended eastward wherever or whenever conditions were drier, such as along ridgetops or in dry cycles.²⁹

Ecologists have until recently interpreted the distribution of tall, mixed, and short grass types as representing stable, relatively unchanging adaptations by each plant community to its respective habitat. In the early 1900s Frederick Clements and his student John Weaver developed their model of succession-climax ecology, whereby the first plant community to move into an area would in turn be succeeded by subsequent communities until the "climax" community was reached. Save for climate change, the intervention of humans, or other external factors, communities were thought to inevitably go through successional stages to return to their peculiar climax stage, whether it was northern coniferous forest, deciduous forest, or mixed-grass prairie. Once established, the assemblage of plants and animals composing the "climax community" maintained themselves indefinitely at an unvarying equilibrium. Driving this progression and final arrangement was what Weaver almost mystically described as "an irresistible impulse to reproduce and maintain the climax community."³⁰ Stable climaxes and orderly successions were not the only pattern in prairie ecology, however.

By emphasizing the inexorable succession toward (and the eventual stasis of) climax communities, Clements and Weaver tended to view factors which in some way disturbed successions or climaxes as aberrations from what would otherwise be an orderly ecosystem. Most notably, these factors included fire, grazing, and humans, all of which were seen by climax ecologists as extrinsic to the natural functioning of ecosystems. For instance, referring to the desert Southwest, Clements remarked that "as in various other climaxes, disturbances processes have produced a misleading picture...."³¹ But such disturbances, far from being aberrations, play integral roles in Plains ecology, for they increase the diversity and productivity of the ecosystem. Clements and Weaver acknowledged the presence of disturbances but de-emphasized their importance.

According to Weaver, native grasses were "disturbed only by buffaloes, prairie dogs, other animals, Indians, and prairie fires."³²

What Weaver was of course implying was that in comparison to the severe disturbances recently visited upon the Plains by whites, these kinds of natural disturbances were negligible. But in emphasizing the relative stability of the aboriginal grasslands, Clements and Weaver underestimated the role that natural disturbances had in grassland ecology. In the last analysis, they themselves intimated that such inquiry into disturbances might prove valuable. For instance, in 1936 Clements averred that appreciating the "true significance" of disturbances would require, as he said, "turning to the dynamics involved", a process which "demands...a proper understanding of the effects of disturbance by man, cattle and rodents..."³³ They certainly would have agreed that buffalo, fires, prairie dogs, and Indians affected the Plains, but the question is how and to what degree. In retrospect it is apparent that disturbances affected the grassland ecology in many ways and to a great degree.

Disturbance factors play a crucial ecological role in grasslands--they episodically and unpredictably disrupt a community or population within a discrete area. By destroying part or all of the biomass inside the affected patch, natural disturbances create "open" space, or gaps, in which resources are more available than in closed, undisturbed communities around them. These gaps produce a mosaic of micro-environments, more or less discrete habitats within a larger ecosystem, which vary according to their kind, size, and the intensity with which they were disturbed. Distributed randomly across the landscape, these patches create heterogeneous habitats, which in turn diversifies the kinds of species that can inhabit the ecosystem.³⁴ In this way the diversity and complexity of grassland communities is maintained by various sorts of disturbances, including (as we shall see) grazing, fire, and the burrowing of prairie dogs and gophers. Taken singly, none of these isolated disturbances significantly affected the distribution or abundance of species within the Plains, but taken as a whole, their synergistic effect was to maintain a shifting mosaic of habitats, composed of innumerable patches of disturbed, successional, and climax communities.³⁵

In 1800 Alexander Henry saw buffalo herds extending as far as he could see. Interestingly, though, Henry was as struck by the herds' effects on the land as he was by their immensity. While watering, the herd virtually destroyed the

brush and grass along the river, trampling the ground as thoroughly as that in a barnyard. As if to impress the effects of herds even more, two years later another large herd of buffalo "so completely destroyed" the grass around his post that twenty-eight of his horses starved to death. The degree to which herds disturbed the grasslands could indeed be striking, one instance of which Captain Grant Marsh reported in 1867. From his steamer, traveling up the Missouri near the Yellowstone, Marsh was agape as he watched an enormous buffalo herd cross the river:

As they swept towards the precipitous bank of the north shore and plunged over into the stream, clouds of dust arose from the crumbling earth, while the air trembled with their bellowing and the roar of myriad hoofs. The south was turned into a liquid mass of mud by the water streaming from their sides as they scrambled out, and thundered across the prairie.³⁶

The effects of herds were especially marked where they concentrated, such as during the summer mating season, near wallows, or along rivers. Here, the herding effects were more prolonged, and could in fact become predictable features of the grassland. On his way up the Missouri, Catlin and a group of others on horseback made their way through a section of the tallgrass prairie by following a "buffalo trail, where the traveling herds have slashed down the high grass... [which] was higher than the backs of our horses."³⁷ When the Lewis and Clark expedition was near the mouth of the Kansas River, Clark similarly observed that in the valley the tracks made by smaller game, like deer, were "as plenty as hogs about a farm."³⁸ Later in their journey, they found that buffalo and other animals had long-used, well-worn trails, some of which were ten feet wide. Generally following the river, these paths occasionally "cut off points of land and pursued a direct course."³⁹ Even further up the Missouri, as the expedition was portaging their dugout canoes around the Great Falls, they in fact found an extreme case of the effects that buffalo herds could have on the land. Nearing the Falls in June of 1802, Clark watched herds of buffalo as they followed their annual migration route across the river. Interestingly, for miles on both sides of the river the ground had been severely trampled, the ecological effects of which were painfully obvious to every man in the expedition. Where the buffalo routinely trampled, only prickly pear cactus could grow, leaving a carpet of spines in between the expedition and their destination. Even worse, all

the men had but moccasins to wear, and so they had to spend eleven insufferable days portaging around the Falls--and over the prickly pear.⁴⁰

Few places on the northern Plains were as severely or as regularly disturbed as the land around the Great Falls. Only where herds regularly coalesced was the grass so trampled. For this reason the Great Falls might be taken to represent one extreme on a continuum of disturbance, ranging from severe and regular to light and episodic. In contrast to trails along rivers or annual migration routes, most areas were disturbed infrequently. The effects of these disturbances, falling somewhere in between the extremes, depended on their intensity, frequency, and the original condition of the plant community. Within these intermediate ranges, disturbance by herds had a number of important ecological effects. These include the cycling of biomass and nutrients, and, surprisingly enough, the increasing of grasses' overall productivity.

Trampling served to cycle biomass and nutrients by grinding the dead, dry grass into the soil, where it was more readily degraded into humus by fungi, bacteria, and insects. Little decomposition occurs while the grass still stands in the air. As buffalo or other animals trod on the grass, then, they were in effect grinding it into the humic layer, accelerating its decomposition.⁴¹ And despite its down-trodden appearance, such areas were actually in the process of fertilizing themselves through the decay of their dead members, which stored otherwise unavailable nutrients. Even more counter-intuitive than the benefits of trampling is the way grazing of grasses increases their productivity.

At first glance, grazing would seem to be a positive detriment to grasses, yet closer observation reveals that grazing can in fact have a salutary effect on the productivity and composition of grasslands. Grazing increases productivity in two ways. After having been grazed, grasses obviously grow back, the effect of which is that more biomass, in the form of leaves and stems, are produced in one year than without grazing. In addition, for some grasses grazing promotes clonal growth through lateral shoots, which may increase their evolutionary success.⁴² But generalizations of this sort can be misleading; for the actual effects of grazing on grasslands depends on many factors. Indeed, these specific effects relate, as range ecologist Alan Savory has demonstrated, to the timing, intensity of kind of grazing involved, as well as the kind, successional state, and resilience of the grassland involved.⁴³ On the aboriginal Plains, there were two main ungulate or grazing animals, the buffalo and the pronghorn antelope, each of which had specific grazing habits and, thus, specific effects on grassland ecology. As

ungulates sharing a common resource--namely, the primary productivity of grasslands--buffalo and antelope reduced their competition for this resource by partitioning it between themselves. With their different physiological requirements, body size, and even shape of their mouths, buffalo and antelope grazed differently. Pronghorns, with their slight size and small mouths, prefer to eat cool-season broad-leaved plants, which have high nutritional value but relatively low abundance. In contrast, buffalo discriminated between their forage less, though they did prefer warm season grasses, which have lower nutritional value but are much more abundant than broad-leaves. To compensate for their low quality forage, buffalo ate more of it and digested it more thoroughly than other ungulates can.⁴⁴ The significance of their grazing efficiency would later be demonstrated, as we shall see, when cattle in effect replaced buffalo as the main grazer on the northern Plains. As a result of their differing diets, buffalo and pronghorn did not compete for the same resource--except, of course, when and where food was scarce--and therefore were able to maintain larger overall populations on the same land area than if they had competed.

How buffalo and pronghorns grazed was as important as what they grazed. The patterns in which buffalo grazed were implied by the two characteristics which whites found most fascinating about them: the immensity of their herds and their irregular distribution across the landscape. As white accounts recall, herds would be tightly congregated but would usually be widely dispersed. Indeed, whites were perplexed by how they could travel for days without seeing a single buffalo and then all of a sudden be surrounded by a swarming and at times stampeding mob of them. "It is a gregarious animal," observed Father DeSmet, who as a missionary traveled across much of the Plains, "and is seldom seen alone."⁴⁵ Not surprisingly, these behavioral patterns were determined by the condition and distribution of their forage.

In the summer and fall, grass was obviously abundant. Buffalo by the hundreds and thousands then congregated in big, dense herds. Yet in any given area, the herds, as their population density increased, obviously grazed the grass more quickly. To Father DeSmet, a missionary who traveled the northern Plains extensively in the mid-1800s, the effects of this intense, localized grazing were apparent. In contrast to the cattle with which he was familiar, DeSmet observed that buffalo move as a herd in one direction while grazing, staying but briefly in any one area. As a result, he realized that they grazed an area only once in a while; otherwise, there would not have enough grass for the entire herd.⁴⁶ In

response to their own grazing pressure, as well as to the quantity and quality of forage, buffalo herds moved--always freely and not infrequently far--until they obtained food, water, and shelter. Thus the location and density of herds depended on the state of the grasslands, a relationship that goes a long way in explaining seasonal behavioral patterns which whites mistook as happenstance. For instance, great numbers of animals gathered for the mating season during the height of summer, when grass was most abundant. From a description by John Tanner, who at the time was being held captive by the Chippewa along the Red River, it is not surprising that the frenzied rut was called the "running season." "A part of the herd," Tanner explained, "was all the time kept in constant motion by the severe fights of the bulls. To the noise produced by the knocking together of the hoofs when they raise their feet from the ground, and their incessant trampling, was added the loud and ferocious roar of the bulls...."⁴⁷

The running season was an intense but short-lived affair, for as food, water, and shelter became scarce in the fall, the herds dispersed. In so doing they did not need dense concentrations of resources. Usually they moved off the Plains and down into protected river valleys, where other kinds of forage were available. In addition, buffalo herds apparently migrated perhaps two or three hundred miles south in the winter, so as to find grass which remained edible longer in the fall and sprouted earlier the following spring. Such migrations account for the well-traveled paths across the Missouri, one of which Lewis and Clark had stumbled upon, and explain in part the seasonal distribution of buffalo.

In ecological terms, the effects of herds and grazing acted to periodically disturb the grasslands as well as to cycle primary production from grasses back to the soil. In the mixed grass plains, as much as fifty-five percent of the total primary productivity cycles through grazers, either by consumption and defecation or trampling.⁴⁸ The effects of both on the grasslands depended on what, when, how, and by whom the grazing was done. Seasonal migration patterns served to avoid local food scarcities, which kept the grazers from starving and also kept the grasses from being overgrazed. Not that the grasslands escaped unscathed, however: the presence of highly disturbed areas, such as around the Great Falls, suggests that buffalo did in fact affect the ecosystem severely. But in general those effects seem to have been beneficial to both grazer and grassland, a supposition supported by the long coevolutionary history they shared. As Weaver and Albertson point out, "grazing animals have

roamed the Great Plains throughout the geological ages,"⁴⁹ adapting ecological behaviors and physiological features in response to each other.⁵⁰ Grazers and grasses had long adapted to each other as the primary components of grassland ecosystems.

In addition to buffalo herds, fires were a unique feature of the Plains, one which was for obvious reasons a source of much concern on the part of Indians and whites. With nothing but infrequent bluffs or rivers to arrest them, and blown by incessant, sweeping winds, fires raged for miles until rain, changing winds, or lack of fuel finally suffocated them. In the meantime they could—and did—engulf anything or anybody in their paths. Their rate and intensity obviously depended on the amount of wind and dry grass, and so fires on the short grass plains, where fuel was scarce, were not so frightful. But where wind, fuel, and fire coincided, the prairie turned devilish. These were, as Catlin described them, "the war, or hell of fires." Catlin explained that "the flames are driven forward by the hurricanes, which often sweep over the vast prairies of this denuded country.... Before such a wind," he concluded, the fire "travels at an immense and frightful rate."⁵¹ If the Plains were an inland sea, as many have said, prairie fires were its hurricanes—or, as poet John Neihardt put it, its "scarlet hurricanes of light."

In the wake of fires, the earth was left "a black and doleful color," as Catlin said.⁵² Emphasizing their destructive aspect, many whites presumed that fires were without redeeming value, ecological or otherwise. Such presumptions notwithstanding, prairie fires wreak not so much destruction as temporarily disturb the grassland. In fact, though their appearance and effects were dramatic, fires actually disturbed grasslands to a lesser degree and for a shorter period of time than one would guess from reading historic descriptions of them. Where fires seemed to leave only scorched earth, they typically did not burn everything, for the very winds which gave them their terrifying speed did not let them stay in one place very long. Burning hot but moving fast, prairie fires singe only the surface, and usually leave a layer of unburned mulch intact.⁵³

Fires obviously altered the ecology of burned patches, and some of these alterations decreased the resiliency of the burned patches. At least until grasses grow back, fires, as a consequence of denuding the land, decrease soil moisture and water infiltration into the soil while increasing evaporation and erosion.⁵⁴ Because fires desiccate what mulch remains on the soil, decomposition of biomass slows for a time.⁵⁵ But within four years the original species

composition and mulch structure usually returns, ameliorating the destruction fires wreak.⁵⁶

This period of rejuvenation, not nearly so dramatic as the burn itself, was in many historic accounts a neglected aspect of fire ecology. The fires were simply more noteworthy than how the grass grew back. The regrowth of grass, however, points to the ways in which fires in numerous ways invigorate grasslands. First, fires speed the cycling of biomass. Compared to fire, decomposition of biomass by means of bacteria, fungi, and soil invertebrates is relatively slow,⁵⁷ especially in the northern Plains. Edwin Denig, who lived from the 1830s to the 1850s at Fort Union, sensed the relationship between the slow decay of grass and fires. His observation was insightful indeed: "The short summer season allows vegetation but little time to decay, and the firing of the prairies, which happens more or less every year in different parts, burns up all old grass, fallen timber and underbrush in the points."⁵⁸ As intimated earlier, grasses are adapted to fires. Most complete their life cycle by mid- to late summer, after which time their above-ground tissues desiccate and turn brown. Obviously fires are more likely to rage when there is much accumulated dry mulch, but by then grasses are dormant, and have translocated their energy reserves from their leaves to their roots, safe from the fires above. Timed to avoid the worst fires, the life cycles of grasses give them an advantage, allowing them to grow well after the fire. For instance, Sandberg's bluegrass, an inhabitant of the western Plains, increased dramatically after fires.⁵⁹ By removing plant "litter," fires effectively let more light reach the blackened soil surface, which warms the soil below significantly.⁶⁰ In sum, fires on the mixed and short grass plains generally accelerate nutrient cycling, and decrease mulch accumulation.

And like grazing, fires help to maintain the long-term dominance of grasses by thwarting the establishment of long-lived broadleaves. The reasons why have to do with the ecology of grass. With its growing points protected at or below the soil surface, grass, as mentioned earlier, can withstand fires better than broadleaf species. For this reason, it rejuvenates unscathed after burns. But broadleaves are not so lucky, and after fires their numbers dwindle. For this reason ecologists have postulated that on the eastern boundaries of the tallgrass prairie, where grasslands shade into woods, fires in effect deter trees from spreading westward. In contrast, on the mixed and short grass plains, where rainfall limits the establishment of trees, fires reduce the populations of broadleaves. However, weedy or rapidly spreading species of broadleaves, such

as wormwood,⁶¹ do generally flourish for a short time in burned patches. There nutrients are more available because fires act to cycle them, stored in the form of dead, standing biomass, faster than they would otherwise be returned to the soil. Yet in the short term fires open patches in which short-lived, weedy broadleaves might grow. The fact that grasses can withstand grazing and fires, whereas their broadleaf competitors cannot, suggests to ecologist Reichman that grasses produce an excess of foliage, left after the growing season as mulch, in what he calls "a desperate evolutionary gambit." That gambit involves growing excess biomass to "attract" both grazers and fires, which act as "pest management" against the broadleaves but which the grasses themselves can withstand.⁶² If so, grasses are far more active as participants in the ecosystem than we typically assume, interacting in ways that seem more complex and intricate than we have ever imagined.

Far less dramatic than either herds or fires was burrowing, a third kind of disturbance, which most whites seem to have literally overlooked. Burrows, and the prairie dogs, pocket gophers, and badgers that made them, constituted a key component of grassland ecology. Prairie dogs and pocket gophers were important as both herbivores and as the creators of burrow mounds. Prairie dogs mostly grazed the grass within or around their colonies, colonies in which they might live for decades. Within a few years of establishing a colony, prairie dogs increased the proportion of broadleaves (by selectively eating grasses), and also increased the nutritive value of the remaining grasses.⁶³ As a consequence of decreasing the competition from grasses, a variety of other, less competitive species grow better there, thereby increasing the diversity of the area in and around the colony. But over the course of its inhabitation, both the amount and kinds of grasses decreased; eventually colonies are almost entirely denuded of grasses. But the forbs remain, taking every advantage of decreased competition.

Unlike prairie dogs, pocket gophers in effect graze while burrowing underground. As such, they need very high quality foods like succulent roots which grow in nitrogen-rich soils. For this reason pocket gophers seek out such rich soils in selecting where they will burrow and graze. As a result of their burrowing, pocket gophers, like prairie dogs, create mounds of soils outside their holes. Near the Mandan villages Lewis noticed the mounds made by an animal he identified as the Dakota pocket gopher. "The little hillocks which are thrown up by these mammals," he observed, "have much the appearance of ten or twelve

pounds of loose earth poured out of a vessel on the surface of the plain."⁶⁴ These so-called hillocks create small habitats, which differ ecologically from the surrounding habitats. Pocket gophers' mounds have especially fertile soils, and receive more light than soils under grasses. With high nitrogen and light, the mounds are open to pioneering species, species which might not otherwise succeed. Like young prairie dog colonies, pocket gophers' mounds thus have the effect of increasing species diversity on the Plains.

Some plants only live in these disturbed habitats. For a variety of reasons, such species are suited to specific habitat conditions, conditions which are available in disturbed areas. For instance, Hairy Four-o'Clock, unable to compete with perennials in climax sites, grows on badger mounds, where competition is less severe. Interestingly, the badgers which create habitat for Hairy Four-o'Clocks also benefit from the habitat created by ground squirrels, the burrows of which badgers colonize.⁶⁵ The overall significance to the aboriginal grasslands of prairie dog colonies and pocket gophers' mounds can be inferred from their great extent: covering over 80 million acres of short and mixed grass plains, their colonies constituted over 20% of the entire region.⁶⁶ Some have even suggested that prairie dogs and pocket gophers altered the Plains landscape in large-scale and long-lasting ways. Throughout the western grasslands are the so-called "Mima mounds"—subtle, lens-shaped hills approximately two meters high and twenty-five to fifty meters wide, which in places number as many as 50-100 per hectare. With no known creator, the Mima mounds have long perplexed scientists; yet some now think that they in some way result from burrowing animals, like prairie dogs and pocket gophers. Even if Plains rodents did not make the mounds, they certainly did increase the diversity of plant communities and, as we shall see, affect grazing patterns of ungulates.

Other common kinds of disturbance included grasshoppers, droughts, and muskrats. Though all part of the same process, each disturbance differs with respect to its scale, frequency, and intensity.⁶⁷ Obviously a badger mound affects only a small area whereas a fire might alter tens or even hundreds of square miles. Likewise, a herd of buffalo would have left more grass than would have a long-term colony of prairie dogs. And by the same token, grasshopper outbreaks occurred less frequently than fires or herding effects. In addition to the nature of the disturbance, the effects of disturbances on specific organisms also varied.⁶⁸ For instance, grasses can grow on pocket gopher mounds and anthills but forbs find them too disturbing.⁶⁹ Taken singly, each disturbance changes its

environment to such a degree that other organisms and populations respond. But of course disturbances are not discrete; they always occurred within the context of other disturbances, the effects of which also altered the environment. In this way, disturbances overlap, making it hard to isolate one from the others. As ecologist Scott Collins has pointed out, disturbances have "additive effects," one of which is to "further increase diversity."⁷⁰ Combined, the effects of respective disturbances can be described as a "disturbance regime," or a scale of disturbance ranging from low to high.

The diversity of species in a grassland is likely to be low at the extremes of the regime, where disturbances are either severe, frequent, and widespread, or light, rare, and localized. But in the intermediate ranges, where disturbances are moderate, diversity appears to be maximized.⁷¹ The reasons why are as follows. By diversifying the micro-environment within the affected patches, or by making dominant species less competitive, disturbances act to increase plant species diversity. For instance, the Blow-Out Penstemon, like the Hairy Four-o'Clock, is dependant on disturbances. As its name suggests, the Blow-out Penstemon is to be found where light, sandy soils (such as those in the Nebraska Sand Hills) have literally been blown out by the wind. To these areas Blow-Out Penstemon are restricted, a fleeting existence made all the more so by the fact that the species is endangered. Its existence depends on the maintenance of its habitat, an ironic requirement considering its habitat depends on being disturbed. Likewise, the Golden Coreopsis was especially likely to inhabit abandoned buffalo wallows, where water was dependable. In the late 1800s, the ecological association of Golden Coreopsis and buffalo was recognized by settlers on their way west. Needing the water in buffalo "lagoons," travelers located them by the presence of Golden Coreopsis. As Willa Cather, who heard recollections of such things as a child in pioneer Nebraska, remembered, they "could recognize the lagoons from afar by the clouds of Golden Coreopsis which grew up out of the water and waved delicately above its surface. Among the pioneers the coreopsis was known simply as "the lagoon flower."⁷²

In the natural grasslands there were undoubtedly many more of these kinds of associations, giving rise to plant populations as diverse as the disturbances which maintained them. For this reason there was a great diversity of plant species in the natural prairie, even though a few grasses was by far the dominate species. Though the population densities of most species were low, especially compared to those of the grasses, the number of populations was

great. For instance, in one square mile of mixed grass prairie, located within a dozen miles of the Mandan Villages at the Heart River, there were over 250 species of plants.⁷³ On average, the mixed grass prairies might contain as many as 100 species, with a few dominant grasses and a host of others. This plant diversity existed by dint of habitat diversity: differences in soils, nutrients, microclimates, and disturbance regimes all acted to diversify the prairie as an environment.⁷⁴

In addition to altering conditions for plants, disturbances created new environments to which animals variously responded. Sensing the changed conditions, animals behaved differently according to the nature of the disturbance. For instance, buffalo preferred to graze grass growing after a fire because in those disturbed patches there was more fresh, nutritious grass than in unburned areas, where old, dry grass predominated.⁷⁵ This interaction between burning and grazing, as we will see, was known by Indians and manipulated accordingly. Even more interestingly, buffalo and pronghorn antelope responded in their own way to the disturbances represented in prairie dog colonies. Preferring broadleaves, pronghorn tended to graze within the perimeters of colonies, where there are more broadleaves than grasses because the prairie dogs prefer grasses. Seeking the most nutritious forage, buffalo tend to feed around the edges of colonies, where the grasses, nibbled by the prairie dogs, were rejuvenating and thus especially lush. Forming "associations" of grazers, such complex interactions are based not on competition but rather on the avoidance of competition through the spatial or temporal separation of resources used by different species.⁷⁶ And these interactions revolve around the respective disturbances of each species.

In contrast to the succession-climax model of grasslands, in which disturbances were seen as aberrations from an otherwise stable equilibrium, the ecology of disturbances and patch dynamics portrays the Plains as an ever-shifting series of alterations which set in motion an equally diverse number of successions. Depending on subsequent disturbances, these successions may or may not return to the predicted climax communities. As such the overall character of grasslands, not to mention the distribution and abundance of its species, is dependent on what at first glance appear to be random events, such as where wind will blow a fire or where prairie dog colonies are located. A single disturbance and its effects do indeed appear random, but taken as a whole, all the isolated disturbances and their respective effects can be seen as exhibiting a

pattern. That pattern was formed by a large number of variables which interacted, however randomly, in a way that produced the Plains ecosystem. Insofar as the Plains ecosystem exhibited an overall stability, as evidenced most vividly in the regular distribution of tall, mixed, and short grass communities, disturbances can be seen as random on the level of patches, but as highly (though not completely) ordered on the level of the ecosystem. Along these lines, O. J. Reichman has found an apt metaphor to express the relationship between fluctuating patches and stable prairies. "If habitats are the themes of the prairie," he muses, "the patches are the variations, combining in an ecologically concordant fashion, that gives the appearance of a unified whole."⁷⁷

The Plains may have owed its creation to grand and dramatic forces, such as the ascensions of mountains or the movements of air masses, but in large part it owed its continuance to comparatively subtle processes, such as the way hooves imprint sod or the diggings of prairie dogs. As such, the ecological paradox of the Plains can be phrased in this way: its stability as an ecosystem depended on the episodic disruption of its constituents. The degree to which various cultures of farmers on the Plains have understood this paradox, and adapted their agricultural practices accordingly, has determined in large part how well they have lived within its ecological parameters.

¹ Catlin, Letters and Notes on the Manners, Customs, and Conditions of North American Indians, Vol. 1, pp. 80-81.

² Catlin, p. 92.

³ Catlin, pp. 121-122.

⁴ David Thompson, quoted in Crawford, History of North Dakota, Vol. I, p. 66.

⁵ Alexander Henry, quoted in Crawford, pp. 70-71.

⁶ Meyer, The Village Indians of the Upper Missouri, p. 1.

⁷ Griffin, "Timber Procurement and Village Location in the Middle Missouri Subarea," p. 179.

⁸ As quoted in Abel, Tabeau's Narrative of Loisel's Expedition to the Upper Missouri.

⁹ Cutright, Lewis and Clark: Pioneering Naturalists, p. 75.

¹⁰ Tabeau, in Abel, p. 97.

¹¹ Catlin, p. 72.

¹² Cutright, p. 123.

¹³ As quoted in Nasatir, Before Lewis and Clark: Documents Illustrating the History of the Missouri, 1785-1804, Vol. 1, p. 295.

¹⁴ LaVerendrye, as quoted in G. Hulbert Smith, The Explorations of the LaVerendryes in the Northern Plains, 1738-43, p. 50.

¹⁵ Catlin, p. 19.

¹⁶ Malin, The Grasslands of North America, passim; Webb, The Great Plains, passim.

¹⁷ As quoted in Cutright, p. 138.

¹⁸ As quoted in Crawford, p. 72.

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- 19 From "An Army Wife on the Upper Missouri," Sarah Canfield's Diary 1866-1868, Ed. Ray H. Mattison, p. 198.
- 20 Craig, "North Dakota Life: Plant, Animal, and Human," p. 325.
- 21 As quoted in Wilkins and Wilkins, North Dakota: A Bicentennial History, p. 20.
- 22 Malin, p. 120.
- 23 Last Heat Moon, "PrairieEarth," The Atlantic, p. 48.
- 24 Wallace Craig suggested such a shift in our understanding of the northern Plains as early as 1908. See "North Dakota Life: Plant, Animal, and Human," Bulletin of the American Geographical Society, 40.6 (1908): 321-332.
- 25 See Walter Prescott Webb, The Great Plains.
- 26 Reichman, Konza Prairie: A Tall Grass Natural History, p. 60.
- 27 Ibid.
- 28 Harrington, Jr., and Harmon, "Climate and Vegetation in Central North America: Natural Patterns and Human Alterations," pp. 104-105.
- 29 See J. E. Weaver and F. W. Albertson, Grasslands of the Great Plains; and Theodore Van Bruggen, Wild Flowers and Grasses of the Northern Plains and Black Hills.
- 30 Weaver and Albertson, Grasslands, p. 22.
- 31 Clements, "The Origin of the Desert Climate and Climate," p. 90.
- 32 Weaver and Albertson, Grasslands, p. 75.
- 33 Clements, p. 90.
- 34 White and Pickett, "Natural Disturbance and Patch Dynamics: An Introduction."
- 35 Strictly speaking, the historic Plains might not be properly defined as a "shifting mosaic" because, as White and Pickett maintain, such a state implies an equilibrium between patches and the larger landscape, which can only be ascertained if: 1) "feedback" occurs between community characteristics and the frequency of disturbance events, i.e., a given area is more susceptible to disturbance the more time has elapsed since it was disturbed last, 2) patch size is small relative to homogeneous landscape, 3) stable disturbance regimes exist. But the term is suggestive nonetheless.
- 36 As quoted in Lounsberry, Clement, North Dakota: History and People, p. 37.
- 37 Catlin, vol. II, p. 18.
- 38 Ibid., p. 65.
- 39 Cutright, p. 143.
- 40 Cutright, pp. 162-164.
- 41 Dix, "The Effects of Burning on the Mulch Structure and Species Composition of Grasslands in Western North Dakota."
- 42 Reichman, op cit., 62.
- 43 Savory, Holistic Resource Management.
- 44 Schwartz and Ellis, "Feeding Ecology and Niche Separation in Some Native and Domestic Ungulates on the Shortgrass Prairie;" Peden, et al., "The Trophic Ecology of *Bison bison* on Shortgrass Plains;" Ellis, "Comparative Aspects of Foraging Behavior of Pronghorn Antelope and Cattle."
- 45 DeSmet, Life, Letters and Travels of Father DeSmet Among the North American Indians, p. 1397.
- 46 See DeSmet, "The Buffalo Chase," in Crawford, vol. 1, p. 71.
- 47 As quoted in Lounsberry, p. 33.
- 48 Dyer, "The Role of Herbivores in Grasslands," p. 258.
- 49 Weaver and Albertson, p. 8.
- 50 Ibid., p. 9.
- 51 Catlin, Vol. II, p. 17.
- 52 Ibid.

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- 53 Gartner and White, "Fire in the Northern Great Plains and Its Use in Management."
54 Ibid.
55 Dix, p. 55.
56 Antos, McCure, and Bara, "The Effect of Fire on an Ungrazed Western Montana Grassland."
57 Gartner and White, p. 15.
58 Denig, Five Indian Tribes of the Upper Missouri, p. 67.
59 Antos, et al., pp. 362-363.
60 Antos, et al., p. 357.
61 Dix, p. 53.
62 Reichman, p. 62.
63 Coppock, et al., "Plant-Herbivore in a North American Mixed-Grass Prairie," pp. 3-5; Wicker and Detting, "Ecological Consequences of Prairie Dog Disturbances," p. 779.
64 As quoted in Cutright, p. 130
65 Platt, "The Natural History of a Fugitive Prairie Plant (*Mirabilis hirsuta* (Pursh) MacM.)."
66 See Nancy Huntley and Richard Inouye, "Pocket Gophers in Ecosystems: Patterns and Mechanisms;" Victor Scheffer, "Do Fossorial Rodents Originate Mima Type Micro Relief;" April Wicker and James Detting, "Ecological Consequences of Prairie Dog Disturbances;" D. L. Coppock, et al., "Plant Herbivore Interactions in a North American Mixed Grass Prairie."
67 Collins, "Interaction of Disturbance in Tall Grass Prairies: A Field Experiment;" Pickett and White, p. 9.
68 Ibid.
69 Gibson, "Effects of Animal Disturbance on Tall Grass Prairie Vegetation," p. 148.
70 Collins and Barber "Effects of Disturbance on Diversity in Mixed Grass Prairie," p. 92.
71 Collins and Barber, "Effects," p. 90; Collins, "Interaction."
72 Cather, "Nebraska: The End of the First Cycle."
73 Weaver and Albertson, p. 367.
74 Coupland, "Ecology of Mixed Prairie in Canada."
75 Steuter, Grygiel, and Biondini "A Synthesis Approach to Research and Management," p. 62.
76 Kirsten Krueger, "Feeding Relationships Among Bison, Pronghorn, and Prairie Dogs: An Experimental Analysis."
77 Reichman, p. 40.

Indian Agriculture

The cultural context of Mandan, Hidatsa, and Arikara agriculture and land use was formed in large part by their system of social relations. Social relations established how elements of production like land, labor, and economic exchange were organized. At the same time notions of proper social relations inserted a paradigm of reciprocity into economic activities, whether in relation to other Villagers, the land, or to a lesser degree, members of other tribes. Composed of complex linkages between clans, age-groupings, and extended families, this system was a defining characteristic of Village Indian society. Since each village was economically and politically independent, social relations therein constituted the basic ordering scheme of village society generally. "To understand the pattern of their life," as anthropologist Preston Holder observes, "one must understand the socioeconomic web which held the village together."¹ That web was made of many threads, each of which tied individual Villagers to an array of social and economic institutions.

The way the Mandan conceptualized their social organization is described in myths regarding the Okipa Ceremony, which present an ideal model of relations between social institutions like clans and the village as a whole. Although all the clans only came together at the Okipa Ceremony, the major summer ceremonial at which time the whole tribe assembled, they nonetheless thought of themselves as united, sharing a sense of common traditions and purpose.² This sense of unity was depicted in the Okipa myths and enacted at the Okipa ceremony. The myths recount the building of the Okipa lodge where the Okipa Ceremony took place. All thirteen of the Mandan clans participated in building the lodge, with each erecting one of the lodge's thirteen cottonwood beams. Into the post holes of their respective beams, clans on the east side of the lodge placed yellow corn while the clans on the west side placed buffalo hair,³ in acknowledgement of the fact that agriculture and hunting were the physical as well as spiritual foundation of their lives.

Insofar as the Okipa lodge included all the Mandan clans (and thus every Mandan), it was a microcosm of the Mandan social universe, and served as a focal point for Mandan identity. The degree to which Mandan identified with their tribe in this way is indicated by the longevity and perseverance of the Okipa traditions in the face of social upheavals. By the 1930s, only four of the original

thirteen clans survived (the others had literally died out as a result of epidemics or were abandoned as a result of acculturation). But Mandans continued to describe their social organization according to the pattern spelled out in the Okipa traditions, emphasizing how effectively these traditions expressed their identities as well as how deeply they were ingrained with Mandan identity.

Within the villages, the smallest social and economic unit was the extended family. Unlike nuclear families, extended families included three or four generations of related women, whose lineage owned the earthlodge in which their husbands, children, and extended relatives lived. The extended family served for children as the basis on which subsequent social relations would be formed. Rules regarding behavior toward close kin, emphasizing above all else reciprocity, were applied elsewhere as childrens' social sphere widened outward to eventually include the entire village.⁴ Beyond extended families, each individual was a member of other social groupings as well. Clans that linked related lineages and cross-cutting groups based on age were two of the most important of these, at least among the Mandan (the Arikara did not have clans.⁵) As in extended families, membership in clans and age-groupings defined status and role behavior that entailed economic obligations. Contributing good and services to other members was expected, particularly for the preparation of ceremonies or in times of need. Yet based on the principle of reciprocity, one was in turn be offered aid when he or she needed it.⁶

In this socioeconomic system, prestige was determined by one's generosity, ability to fulfill social obligations, and wisdom. By giving gifts of food, artifacts, or skills, villagers increased their standing in the eyes of their fellows. In this way behavior that aided others was rewarded. For instance, in wintertime when a village was hungry, a man might fast in prayer seeking to bring bison close to the river. "Such a person was said to place the welfare of the village above consideration for his personal comfort" and was given gifts of thanks by people in the village.⁷ However, not all gained prestige by such good works. As members of "leader" families, some Villagers were born into status. Especially among the Arikara, villages were to some degree stratified between leader and commoner families. Although most individuals gained prestige and the power that came with it by the force of their wisdom and the persuasiveness of their speech, status within the leader families derived more from religious sanction than from public validation. Such leader families could maintain their stature regardless of their behavior; obversely, commoners could not ascend to

their level of prestige regardless of their prosocial behavior. The Villagers were in this sense stratified, having what Preston Holder calls "nascent classes." But these classes, as he points out, were nothing compared to those in modern, industrial societies, for the disparities of income between them were relatively small, the leaders few, and the lines separating them somewhat "fluid."⁸

Social relations as such constituted the context in which Village Indian agriculture and land use occurred. Since economic activity was subsumed in social relations, economics was defined and delimited by the way Villagers constituted their communities. Two aspects of their communities were particularly important insofar as economics was concerned. Initially, individuals defined their economic interests in relation to others. Because the basic socioeconomic unit of the villages was the earthlodge, the economic activity of its members was woven into the avowedly moral fabric of the extended family. On the level of the village, the largest and self-sufficient socioeconomic unit, economics was similarly subsumed in social relations. And on both levels economic production and distribution was founded on reciprocity, a pattern of interaction which was most viscerally learned in lodges and then applied more or less directly to Villagers as a group. Whether in war, hunting, skills in crafts, or in performing services for others, individual activity was thus rewarded on the basis of its benefit to the groups of which individuals were members. (This will be even more poignantly demonstrated when it comes to the economic relations with the tribe.) And secondly, the social structure was stable. With extended families, the household unit continued despite the divorce, movement of villages, or death of a few of its members.⁹

In their system of land tenure, the Villagers distinguished between the upland plains, which were held for communal use, and the valleys, which were held by clans for use by individual women. Though not physically demarcated, the boundaries of their territory were generally acknowledged by neighboring tribes.¹⁰ Within the valleys, in contrast, parcels of land were established in the process of clearing the forest. Once established, a field became the rightful possession of the woman who did the primary work involved in clearing. Until her death she maintained the right to use the land at her discretion. She might herself cultivate it, let it lay fallow, or let someone else use it. Boundaries between fields were marked, and adjoining fields were separated by a four foot wide strip of otherwise unused land. If a woman wanted to cultivate that strip, however, she had to ask the woman who owned the adjoining field. Despite

these institutions, and a feeling that fields were "sacred," disputes over land use and ownership did occur. The following instance was recorded by Gilbert Wilson in his interviews with Buffalo Bird Woman, a Hidatsa woman who was born in the 1830s. Buffalo Bird Woman's "mothers", i.e., those within her extended family, once caught two neighboring gardeners encroaching on their field. When confronted, Buffalo Bird Woman says, "the two women yielded...."¹¹, acknowledging the primacy of tribal custom with respect to land use and rights. When a woman died, the clan to which she belonged assumed rights to her land, and dispensed with it as they saw fit. If asked by another woman, the clan could let her cultivate it; one of their own members could cultivate it; or they could let it lay fallow.¹²

Land among the Villagers was regarded as something not to be bought, sold, or otherwise owned for the sake of profit. Instead, their system of land tenure was based on usufruct, or the principle that one has a right to the fruits of one's own labor but not necessarily to the land in particular or the means of production in general. In this sense, the terms of tenancy were not so much of possession as of use given by virtue of clearing the land. Individuals were said to "own" land but the Villagers apparently thought one's claim to the land lessened if they did not themselves use it. At least in the valleys, land was to be dispensed according to the precepts outlined above and gardened to the extent of a woman's capacities and inclinations. Once she no longer used the parcel, others saw it as potentially available, provided the original owner assented. As R. Douglas Hurt observes, this kind of tenure system promoted an equitable distribution of land: everyone had access to all they needed but none could "hoard" land.¹³

The Mandan, Hidatsa, and Arikara shared a common economic system even though their social, religious, and political organization differed to some degree. The ways in which economic goods were procured, processed, and distributed were similar among the different tribes and villages. Thus the following description, with exceptions for regional variations I will note, applies to all of the villages. In the course of an annual cycle, commencing in the spring and concluding the following winter, the Villagers did all the tasks involved in preparing fields for cultivation, planting and cultivation, hunting and wild plant gathering, harvesting and food preservation. After harvest, the Villagers engaged nomadic tribes in extensive trading, a period of much economic

importance and social festivity. Before the onset of winter, some Villagers went hunting again, or prepared to move down into the sheltered bottomlands, where they endured the coldest parts of the winter.¹⁴ In spring, with their food reserves not infrequently running low, the Villagers eagerly started planting.

Of all the agricultural tasks, clearing new fields of trees and breaking up the sod were by far the hardest and most time-consuming. In the fall trees were girdled, fell, and then left to dry. Not all trees were cut, however; those left standing served as stands from which women and their daughters later watched the fields, protecting the crops from other tribes, crows, deer, or hungry boys. In the spring women burned the trees and brush where they lay on the ground, a practice which, according to Buffalo Bird Woman, "softened the soil and left it loose and mellow for planting."¹⁵ This was no small benefit, since breaking the sod with digging sticks took prodigious amounts of labor. For this reason, fields were in the first year small, not larger than an acre, and were later enlarged, depending on the owner's needs and energy. At most fields were 2-3 acres in size.

While breaking the sod, women made the hills in which they planted corn and beans. Each hill stood about 8 to 10 inches high and was about one and a half feet wide. Four feet apart, the hills were arranged in rows which ran the length of a garden. The Indian unit of land measurement, the *nupka*, was measured according to the width of seven such rows, but had no fixed length. An average *nupka* comprised about one quarter of an American acre, but there was no standard size since its length varied "depending entirely on circumstances," such as proximity to another's land, the presence of trees, or a bend in the river.¹⁶ As such Indian fields were small, surrounded by forest or other fields, dotted with a tree or two, and laid out according to the contour of the land.

Within their fields, Indian farmers planted diverse varieties of four main crops—corn, beans, squash, and sunflower—plus tobacco, a minor one. These varieties, each exhibiting unique characteristics, were specifically adapted to the northern Plains' short seasons and semiaridity. Their corn varieties were spectacular in this respect. Originally a tropical species, corn had spread northward, diffusing throughout North America before the arrival of Europeans. At the Villages it reached its northernmost extent on the continent, an extension of its range only made possible with significant evolutionary adaptations. Those adaptations produced a corn plant much unlike the eastern varieties with which

whites had become familiar. Called the northern flints, these varieties were short and bushy, produced many lateral branches (called "tillers") and bore their ears low on the stalk. Their slender ears have as few as eight rows of kernels, and the kernels themselves were shaped like crescents and had hard outer shells (thus their name).¹⁷

The bushy form of northern flint corn, as anthropologist Michael Scullin explains, is an adaptation to seasons that can be as short as 60-70 days long and episodic droughts. With many leaves on each tiller, flint corns actually have higher amounts of leaf area than eastern varieties, and are thus able to complete more photosynthesis in a shorter period of time. In short seasons, this allows the flints to maximize their use of sunlight, an otherwise limiting resource. In fact, early in the season, before eastern varieties have yet to leaf out, flints produce abundant foliage, taking advantage of all the sunlight they can get. In addition, as an adaptation to drought, Scullin postulates that flints are able to respond to favorable years, whenever they come, by growing more fillers and thus increasing their yields, compensating for low yields due to droughts.¹⁸ If so, flints could be seen as being as variable as the Plains climate, responding to its abundance as well as enduring its adversity, an adaptation of no small importance.

In all, the Villagers had nineteen varieties of corn. Buffalo Bird Woman lists five common varieties of beans. These included such varieties as shield figured, red, spotted, and black. Among their five or six squash varieties, the villages had three species, that of pumpkins, true squash, and cushaw-types. "All the types," according to George Will, who in the early 1900s collected many of the Villagers' varieties and distributed them through his father's Will Seed Company, "had the common qualities of extreme earliness, extreme hardiness, drouth and cold resistance, and I believe are the earliest [i.e. with shortest seasons] of the species."¹⁹ The Villagers had two varieties of watermelon in addition to squash. The only truly native crop grown by the Villagers was sunflower. Being so close to their wild ancestors, most of the Indians' sunflower varieties even resembled the common weedy sunflower growing around them. In fact, Catlin confused the domesticated sunflowers growing in Arikara fields for weeds (i.e., wild ones).²⁰ Like weedy sunflowers, Indian varieties have many small heads, which grow all along the stalk. In addition to these types, the Hidatsa also seemed to have at least one variety with a single large head, often eleven inches wide,²¹

which more closely resembled modern hybrids. And lastly, the Villagers grew tobacco, which Lewis and Clark rightly distinguished from eastern species.²²

The importance of the varieties was at once cultural and ecological. The Villagers invested great care in the diversification and preservation of their varieties. Through selectively saving seed, the Villagers had over the generations adapted varieties to their local environment. These adaptations, though not dramatic, are reflected in the proliferation of varieties, which vary in important ways from those of other regions and tribes.²³ During harvest, elder women scanned the piles of corn for the ears which best embodied that variety's characteristics. These they selected to save for next year's seed, and, with their husks' leaves folded back, braided them together. Seed from other crops was similarly selected, and stored for next year. Emphasizing the value of maintaining the varieties, Buffalo Bird Woman explained that her family "put away seed enough to last for two years; then, if the next year yielded a poor crop, we still had enough good seed to plant the third season."²⁴

Among the Villages as a whole, the continuance of varieties was the responsibility of clans. In the spring, varieties were suitably separated from each other so that they would not cross-pollinate, thereby mixing varieties. As Buffalo Bird Woman said, "we Indians knew that corn can travel...."²⁵ Fields of different corn varieties were thus separated. Apparently the Hidatsa also separated sunflower varieties, with each family planting either black, white, or striped varieties. But the Mandan may have planted large and small headed varieties together. According to Lydia Sage Chase, a living descendant of Scattered Corn, the last Mandan Corn Priestess, the Mandan planted both in the same field because one was considered male and the other female. So combined, they were thought to be more vigorous than when apart.²⁶ Developing and maintaining varieties required close observation, care, diligence, and stability. In a real way, the accumulated wisdom and agricultural experiences of the tribes were embodied in their seeds. Safeguarding their genetic separation, and ensuring their continuance between generations, the Villagers recognized the ecological value represented in their diverse seed varieties. This diversity was valued even further as the Villagers' seeds later infused the fields of both Indian and white farmers located across the northern Plains and (now) around the world with such local land knowledge.

Steeped in cultural tradition, and infused with much significance, the Villagers' seed varieties were preserved despite social and ecological upheavals.

One such variety was that of the big-headed sunflower. Described briefly by Will and Hyde, who mentioned that their "heads were often eleven inches across," big-headed sunflower seeds were kept in sacred bundles, like other crop varieties. These "sacred seed stocks" were planted and regrown every few years, replenishing their vitality. This method of keeping seed did indeed prove valuable as a vehicle for agricultural continuity, as ethnographer Alfred Bowers learned first-hand. In the early 1930s he acquired a sacred bundle, in which there were big-headed sunflower seeds. Through its successive owners, including the last leaders of the Mandan corn ceremonies, Bowers could trace the history of the bundle back to the late 1700s.²⁷ In keeping with that long-established tradition, Bowers maintained the seeds by growing them out in genetic isolation for almost sixty years. In so doing the variety of big-headed sunflower, which is still little-known to agronomists or crop geneticists, persisted through the upheavals wrought by modernization, including the flooding of the Villagers' former fields when the Missouri was dammed in the 1950s.

The Villagers' fields were as ecologically sophisticated as they were genetically diverse. Planting times, tillage techniques, cropping patterns, and resource use were all designed to maximize the efficiency with which scarce resources were used, as well as to ensure the safety of the harvest. Of the scarce resources, precipitation and season length were perhaps most limiting, and so many practices can be explained in terms using these most efficiently. For instance, the practice of hilling performed a variety of functions simultaneously. While hoeing dirt onto the hills women also weeded, decreasing crops' competition for resources. The hills decreased evaporation from around the plants' roots, and, because their angled sides absorbed more sunlight, helped to warm the soil faster in the spring,²⁸ a matter of no small import and feature at the northernmost limit of corn agriculture. As a form of tillage, hilling performed functions necessary for good plant growth. It aerated the soil, reduced compaction and crusting, and incorporated the ashes of the previous year's plants into the soil, which concentrated nutrients and organic matter near the plants.²⁹ Last but not least, hilling anchored the flints against the wind. Unlike dent corn, flint corn does not have brace roots to help support it, and as a result needs to be hilled, lest it blow over.³⁰

Cropping arrangements were designed to lessen competition between crops for such shared resources as light, water, and soil nutrients. In this way village farmers in effect maximized the efficiency with which they used limited

but naturally-available resources. In each field, crops were arranged as follows. Corn and beans were planted in hills, squash between rows of hills, and sunflowers around edges of gardens. The shading of other crops by corn was minimized by dint of the flints' short stature as well as by spacing the hills four feet apart. As such, corn shaded neighboring plants for only a short period of the day: indeed, through the middle of the day, when the sun is high in the sky, hills received almost all of the available sunlight. Crop spacing similarly partitioned the use of moisture in the soil. With eight to ten plants per hill, plant densities were low enough that their total demand for water might not exceed that which could be supplied by the soil itself, apart from the unpredictable rains. If plant densities were increased, however, the crops' demands for water for a time exceeded the amount of moisture stored in the soil. Crops would then likely suffer from drought stress, decreasing yield and possibly risking the entire harvest. In this light it is not surprising that Buffalo Bird Woman emphasized that sunflowers (which use a lot of water) were to be planted far apart, and that only so many seeds of each crop were to be planted in each hill. "Corn planted in hills too close together would have small ears and few of them," she said, "and the stalks of the plants would be weak, and often dried out."³¹ For similar reasons, the Villagers planted corn and beans in separate hills unlike the horticultural tribes in the central Plains who planted them in the same mound.³² The reason for the difference was simple enough: on the northern Plains, where seasons were shorter, corn shades beans too much, an ecological interaction the Villagers must have appreciated by the fact that bean yields are depressed if planted with corn.³³

As with their use of limited spatial resources, the Villagers attempted to make best use of resources in time by planting early and late corn crops. The first crop was planted either when the gooseberries were in full leaf or when the buckbrush showed new leaves, and the second when Juneberries ripened. Since it usually frosted before ripening, the second planting was eaten as green corn about when the first planting was ripe.³⁴ By planting many varieties, many crops with different ecological characteristics, and by staggering planting times, the Villagers employed the ecological benefits of multiple cropping, benefits which include increased efficiency of resource use, greater harvest security, and decreased vulnerability to pest outbreaks.³⁵

In mid-summer, after the second round of hoeing the gardens, the Villagers shifted their energies to gathering wild plants and animals. Collecting

both took them far and wide, throughout their wooded valleys and across the plains beyond. But with the exception of the unpredictable animals, they were on no wild goose chase, for in most cases they rather knew where to find the plants they sought. In fact, even more impressive than the number of native wild plants which were in some way utilized—an impressive array, as we shall see—was the Villagers' precise ethnobotanical knowledge of each. The Villagers were intimately aware of ecology, that is, where and when to find them. And in knowing their landscape intimately, the Villagers were able to use it accordingly. But a few examples illustrate this kind of land knowledge and how it was profitably applied. "Ground cherries grow on the tops of the high hills or buttes," Buffalo Bird Woman noted. "They grow in stony places."³⁶ In the valleys Villagers gathered, as Clark observed in 1804, "a large been [sic] which they rob the mice of the prairie, which is very nourishing."³⁷ This was the ground bean, the seeds of which were first gathered by mice, as Clark noted, but finally eaten by people. Ground beans grow underground, like peanuts, and spread widely on runners. For these reasons they would have been almost impossible to gather by hand. Yet luckily for Indians, ground mice go to the trouble of gathering them as food, storing as much as a bushel of them in their burrows. Upon finding their caches, Indian women took the beans and left an offering in exchange. Wild carrots, in contrast to ground beans, preferred the exposed plains: "Wherever there was a sort of ridge on the prairie, there the snows first melted, and it was here we dug wild carrots," Buffalo Bird Woman told Gilbert Wilson.³⁸ To find "the immense quantity" of prairie turnips which Catlin had earlier observed, the Villagers looked to places like the north side of the river, across from Like-a-Fishhook Village, where a ten-mile wide strip of especially abundant and large turnips grew,³⁹ perhaps owing to nitrogen-rich soils left by pocket gophers.

The Villagers also took advantage of wild plants growing in the gardens, plants which most whites would later castigate as "weeds." These included lambsquarters (eaten green as a potherb), milkweed (the young seeds and leaves of which were mixed in with green corn or buffalo), Jerusalem artichokes (tubers eaten), and wild sunflowers (the seeds of which were eaten much like those of domesticated relatives).⁴⁰ Apparently some Villagers went a step further with wild plants, intentionally introducing them into their gardens as seeds or transplants. Buffalo Bird Woman relates two such instances. Once a woman tried to transplant a species of mint, which was used medicinally to counteract

hemorrhage after childbirth. The other instance involved prairie turnips. Says she: "I remember once hearing of someone planting *ahi* in her garden; but they never grew and the experiment was a failure." However, the Villagers generally rid their gardens of weeds as much as possible. Except for eating those that did grow, introductions of wild species into gardens were probably rare. As Buffalo Bird Woman concluded, "I never heard of any attempts to grow any other wild plants. Besides, there were plenty of all wild plants near the village... we felt no need to try to plant and raise them."⁴¹

Before harvesting began in late summer, the Villagers went on a major buffalo hunt. Along with crops, buffalo meat constituted a major part of their diet, which they obtained either through trade or hunting. During the summer hunts, the Villagers hunted the aggregated buffalo herds as the nomads did. In 1840 such a hunt, occurring near the Sheyenne River, was witnessed by Alexander Ross, a Canadian trader. His description could just as easily be of a hunt by nomads or Villagers. Mounted on horses, "the cavalcade made for the buffalo, first at a slow trot, then at a gallop, and lastly at full speed.... When within four or five hundred yards, the buffalo began to curve their tails and paw the ground, and in a moment moved to take flight, and then the hunters burst in among and began to fire." Duly impressed with the resulting chaos, Ross mixed what were perhaps the most striking metaphors possible: "Those who have seen a squadron of horses dash into battle might imagine the scene. The earth seemed to tremble when the horses started, but when the animals fled it was like the shock of an earthquake. The air," Ross concluded, "was darkened [by dust]."⁴² One might also imagine, since Ross unfortunately did not describe it, what the trampled grass looked like. From such hunts, the Villagers reaped fleshy feasts. But unlike the nomads, who only hunted buffalo in this way, the Villagers also tried to make the buffalo come to them.

To do so, the Villagers lit fires, manipulating what we saw earlier as the ecological relationship between fires, the greener pastures they eventually created, and buffalo. Indians' practice of burning the tall grass prairie has been long noted. While traveling up the Missouri Catlin recorded "accidental" fires, started by lightning or inadvertently by whites or Indians. But Catlin was fascinated by the fact that others fires were, as he said, "voluntarily done for the purpose of getting a fresh crop of grass, for the grazing of their horses, and also for the easier traveling during the next summer...."⁴³ The same practice was employed for similar ends in the mixed and short grass plains. One winter day,

while staying at the Mandan Villages, Clark wrote that it was "a cloudy morning and smokey all day from the burning of the Plains, which was set on fire by the [Hidatsa] for an early crop of grass, as an enducement for the buffalo to feed on."⁴⁴ Apparently the Hidatsa knew that when spring dawned the darkened earth would not so much be a scene of desolation as an especially vigorous, productive patch. And while Clark turned his attention to the effect of fire on buffalo, Lewis considered its effects on trees. After having spent innumerable hours staring out across the Plains, Lewis mused that "this want of timber is by no means attributable to a difficiency [sic] in the soil to produce it, but owes its origin to the ravages of the fires, which the natives kindle in these plains at all seasons of the year."⁴⁵ Although Lewis wrongly intimated that nomads too set fires, he and Clark nonetheless understood how the Villagers in effect used fire as a way of attracting buffalo. In so doing, they altered the composition of plant communities as well as the behavior of herds. Although we have no way of knowing the extent or frequency of these fires, it is not improbable that Village Indians customarily burned the Plains, either as an "enducement" to buffalo, or as a way to destroy their tracks from pursuers, not an uncommon stratagem. In any case, fires of Indian origin added to the complexity and texture of the Indian grasslands, complementing those which occurred naturally.

Upon returning from the hunt, the Villagers began harvesting. First young squash were picked, sliced, and dried. Next, and with great anticipation, green corn was harvested, a festive event which was celebrated annually in the Okipa Ceremony. In addition to engaging the entire tribe, the green corn harvest also attracted bands of nomads, who came each year to trade. A month or so later, the ripe corn, beans, and squash were harvested, processed, and stored. Yielding about twenty bushels an acre, multiplied times hundreds of acres per village, the corn harvests alone were prodigious, a fact to which all observers attested.⁴⁶ The yields of squash and beans were as impressive. From but one acre, the Villagers likely reaped in three to four thousand pounds of squash, and over two thousand pounds of beans, yields which are no less than those produced under modern techniques.⁴⁷ Indeed, if harvests were successful, Villagers were well provisioned against food scarcity, even if the hunts were not.⁴⁸ But if and when both failed, times were tough indeed. Food shortages were most acute in spring, after winter supplies had been consumed but before wild foods had bloomed. During such times any thing available was eaten, including dead buffalo plucked out of the river. In their putrefied condition, as

Denig distastefully observed, these "can be eaten with a spoon," a meal of which the Villagers ate "as much as they can cram down."⁴⁹ In May of 1804, Tabeau witnessed such sorry circumstances among the Arikara, who had a "lack" of corn and found the buffalo to be "also a very uncertain resource." There he met

old people exposed to every danger and hardly keeping up the remnant of their vitality with flowers of the summer pear, with young branches of the willow, with sweet grass, and other herbage. Even after the return of the hunters, who for two months scoured the prairies, and until the young pumpkins were eatable, the three villages lived in a state of destitution, which would pass among us for dreadful famine.⁵⁰

Insightfully, Tabeau distinguished between the state of want from Indians' and whites' varying responses to it. Episodic deprivation was a state Indians went to great lengths to avoid--note their extensive storing of preserved foods--but one to which they had nonetheless grown accustomed. As we shall see, whites rather sought to overcome the link between their economic fortunes and seasonal fluctuations, a difference in cultural perception that helps explain in part the differences between their respective economic practices. Among Plains Indians, scarcity and at times outright famine was a grim reality. But two factors diminished the frequency as well as the intensity of such hunger: the security of harvests, as we already saw, and intertribal trade, to which we shall soon turn.

In a sense, the Villagers' fields resembled the patches of disturbance on the Plains, albeit of a severe and prolonged nature. Certainly clearing, breaking the sod, burning, and cultivating were more intense than any natural disturbance. But the practice of fallowing--whereby fields were cropped for a few seasons and then let rest for at least two years--in effect employed the process of ecological succession that occurs in patches after disturbances. Unfamiliar with fallowing or its ecological benefits, many whites presumed that Indian farmers discarded land after it was spent and simply moved into new, fertile land. Thus Dr. Washington Matthews, an ethnologist who worked at the Fort Berthold Reservation, castigated the Villagers' tillage as rude because they neither manured nor "rotated" their crops. He then mused that "perhaps they have little need of such knowledge, for when the soil was worn they abandoned it, and there was no stint of land in the wilderness." However, considering the labor involved in clearing new fields, it would seem that cleared land to the village was

in fact quite precious. In this respect Matthews' own observation regarding fallowing contradicted his assumption that Indian farmers "abandoned" land. As he continued, "Sometimes after a few years of rest they would resume the cultivation of an old field that was quite near the village, for proximity lent some value to the land...." However, the Villagers did regularly fallow their land, and the reason why was simple and compelling: after a couple of years of cropping, yields decreased, until after four years, as Buffalo Bird Woman noted, "hardly anything was produced... especially in a dry summer."⁵¹ In part, decreasing yields resulted from declining fertility, but mostly they resulted from decreasing soil moisture. To restore fertility and recoup soil moisture, Villagers fallowed. "Everyone in the village knew the value of a two-year fallow period," Buffalo Bird Woman said.⁵² Decades later, white farmers would discover for themselves the value of fallowing; but because they fallowed large, upland fields, their fallowing methods effected the land differently than did the Villagers' methods.

Wild plant gathering also disturbed patches within the grassland, though far less so than intensive horticulture. Digging and turning the soil was obviously necessary to unearth tubers and roots. In so doing, the sod would be broken, and dirt scattered. Providing a rare glimpse at such effects, Buffalo Bird Woman describes the appearance of an area after wild potatoes had been gathered. "Down in the bottomlands along the Missouri, there are places where the wild potato plants grow very thick. And in the harvest season the ground would be dotted with marks where the diggers had been at work."⁵³ As such the disturbances were discrete and localized, effecting but a small area. And like the pocket gopher mounds Lewis and Clark observed in the same riverine habitat, they might have created an especially rich seedbed, where otherwise rare plants may have established themselves.

Even more interestingly, plant gathering activities extended the range of plants' habitats, spreading plants where they otherwise would not have grown. As an ethnobotanist, Melvin Gilmore dedicated his career to the way Plains Indians used native plants. Beyond simply using plants where they found them, Plains Indians, Gilmore speculated, actively manipulated the distribution of plant populations by moving them, either intentionally or inadvertently, great distances across the landscape. Gilmore suspected that such manipulation had occurred when he found plants which Indians regularly used located far away from their main population. For instance, at least two species in the northern Plains probably had been carried long distances by Indians along trading trails,

where they were planted or incidentally established. One of these was Sweet Flag, a species usually restricted to eastern forests, which was much prized by all Plains tribes for its medicinal uses. Along the Mouse River Valley, far west of its natural range, Gilmore found "islands" of Sweet Flag. Considering that eastern tribes like the Assiniboine and Chippewa regularly traveled along the Mouse en route to the villages, Gilmore thought the Sweet Flag was planted by medicinemen, who would return later to harvest them. In a similar way Buffaloberry seems to have been spread eastward. Restricted originally to the Coteau du Missouri, Buffaloberry were rare in the eastern Plains, except along trails running west to east across the Plains. Gilmore found islands of Buffalo Berry in areas through which such trails traversed. With the Sweet Flag, they were located along the Mouse River, as well as in the watershed of the James and Sheyenne River Valleys, and between the villages and the Red River.

In the Central Plains, Gilmore found similar extensions of walnut and crabapple, which were likewise distributed by Indians.⁵⁴ Kenneth Reid has suggested that considering the dietary importance of prairie turnips and the presence of patches of them which were harvested regularly, Plains Indians may have planted their seeds in the holes from which they had just taken their tubers.⁵⁵ If so, Plains Indians may have been engaged in something far more complex than simply gathering plants. By the spread of certain plants and the maintenance of others, Indians were in a sense managing plant populations according to their own needs and designs or introducing new ones.

The ecological effects of Plains Indian hunting practices can be measured in terms of their direct effects on animal ecology, as well as their indirect effects on the grasslands. With respect to animals, Russell Barsh has calculated that if every Indian consumed three to four buffalo a year, multiplied times a population of 150,000 Plains Indians, then the annual buffalo harvest would have been less than 10% of the total herd. This level was well below the limit for "sustainable yield."⁵⁶ Without question the direct effects of hunting were benign. But it is of course harder to consider the indirect effects on grasslands. Clearly, Plains Indians disturbed the grasslands in the course of hunting, whether by burning the grass to attract herds, in the case of the Villagers, or by chasing the herds and thus causing them to trample the grass, in the case of both Villagers and nomads. With not a little dust flying, and the grass trampled thoroughly, the disturbances from such trampling must have been intense in small areas.

According to range ecologist Alan Savory, such intense trampling, if properly timed, can actually improve the vitality of grasslands. Based on comparative studies on American and African grasslands, Savory has found that in addition to returning biomass to the soil, as we have seen, trampling can aerate the upper layer of the soil, decrease crusting, and increase seed germination by improving seed to soil contact.⁵⁷ From this perspective it seems plausible to speculate that as Indians hunted they were also invigorating the grasslands. But the actual effects of the trampling would have depended in part on its timing. Indians increased their buffalo hunting in the fall, since the buffalo are fatter and their hides fuller then. This cyclical pattern of hunting corresponded to the growth cycles of grass. By the fall, many of the warm season grasses have already desiccated, and are left standing dry. At that time trampling would have effectively returned that biomass to the soil, as well as performed some of the effects Savory suggests. If so, Plains Indians may have been inadvertently--though no less importantly--managing the grasslands as they hunted buffalo. Hoofed, horny, and hard to handle, the buffalo were an unlikely (and unwitting) range management tool. But it appears as though buffalo hunting may have nonetheless contributed to a complex system of land use by which Indians managed the grasslands.

Indian land use led not so much to a dominated ecosystem as to a subtly domesticated one: it was "domesticated" in the sense that important features of the landscape, like patches of plants, the frequency of fires, and the manipulation of animals, were as much products of human ingenuity as natural agency. Two features of this management system are most important. The first is that it involved the disturbance of grassland, whether by means of burning dead grass, running herds, clearing fields, or digging in the dirt. This was no unvarying ecosystem, managed for some putative equilibrium. If equilibrium was nonetheless achieved--and it appears as though it was--it was an incidental if not intentional benefit. Following from the first feature, the second feature of Indian land management is that the disturbances it involved were episodic and varied. Regions were not burned every year, herds not run over the same place, fields not farmed continually. Disturbances were thus neither chronic nor static; they rather responded to their own ecological effects. Thus Indians knew that fields farmed continuously yielded less, that grass burned incessantly grew poorly, and that gathering plants from the same place year after year depleted them. In this sense, Indian land management included what in modern parlance might be

called "feedback loops" which regulated the frequency, intensity, and location of disturbances such that they did not overly disrupt an area. In this way, Indian land use may be seen as fitting within larger patterns of grassland ecology, employing equal measures of both disturbance and succession so as to keep their environment productive yet also resilient. In ecological terms, a distinctive feature of Indian land use was its use of both ecological processes of disturbance as well as succession. The success of this land use system, then, can be framed in terms of the paradox earlier posed by Plains ecology: Indian land use operated within the static parameters of the Plains climate but employed the dynamic processes of disturbance and succession.

- ¹ Holder, The Hoe and Horse on the Plains, p. 36.
- ² Meyer, The Village Indians of the Upper Missouri, p. 15.
- ³ Bowers, Mandan Social and Ceremonial Organization, p. 29.
- ⁴ *Ibid.*, p. 37.
- ⁵ Meyer, pp. 71-2.
- ⁶ Bowers, p. 62.
- ⁷ *Ibid.*, p. 85-6.
- ⁸ Holder, pp. 36-7.
- ⁹ Bowers, p. 44.
- ¹⁰ Hurt, Indian Agriculture in America, p. 66.
- ¹¹ Wilson, Buffalo Bird Woman's Garden, p. 11.
- ¹² *Ibid.*, p. 114.
- ¹³ Hurt, p. 66.
- ¹⁴ Hunt, "Seasonal Economics and Settlement Patterns of the Arikara."
- ¹⁵ Wilson, p. 13.
- ¹⁶ Will, Corn Among the Indians of the Upper Missouri, p. 99.
- ¹⁷ Brown and Anderson, "The Northern Flint Corns."
- ¹⁸ Scullin, "The Adaptive Features of Tillering in the Northern Flint Corns."
- ¹⁹ Will, "Squashes and Pumpkins of the North Dakota Indians."
- ²⁰ See Will, Corn Among the Indians, p. 101.
- ²¹ *Ibid.*, p. 83.
- ²² Cutright, Lewis and Clark, Pioneering Naturalists, p. 98.
- ²³ See Gary Nabhan, Enduring Seeds: Native American Agriculture and Wild Plant Conservation, passim.
- ²⁴ Wilson, Buffalo Bird Woman's Garden, p. 48.
- ²⁵ *Ibid.*, p. 59.
- ²⁶ Personal communication, July 1991.
- ²⁷ Bowers, p. 186.
- ²⁸ See Nyle Brady, The Nature and Property of Soils, p. 130.
- ²⁹ Gallagher, "Agricultural Intensification and Ridged-field Cultivation in the Prehistoric Upper Midwest of North America," pp. 576-577.
- ³⁰ Scullin, "Corn Hills and Ridged Fields: Different Means to the Same End?"
- ³¹ Wilson, Buffalo Bird Woman's Garden, p. 23.
- ³² See Will, Corn Among the Indians.
- ³³ Gardner and Larson, Unpublished data based on field experiments.

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- 34 Wilson, Buffalo Bird Woman's Garden, p. 37.
- 35 See Michel Altieri, Agroecology. The Scientific Basis of Alternative Agriculture.
- 36 Wilson, Unpublished Field Notes, 1916: p. 270.
- 37 Cutright, p. 100.
- 38 See Gilbert Wilson, Unpublished Field Notes, kept in the anthropology library at the University of North Dakota, 1916: p. 229.
- 39 Ibid, p. 184.
- 40 Gilmore, "Arikara agriculture," pp. 5-6.
- 41 Wilson, Notes, pp. 187-193.
- 42 As quoted in Lounsberry, Clement, North Dakota: History and People, pp. 34-35.
- 43 Catlin, Letters and Notes, Vol. II, p. 17.
- 44 Cutright, p. 116.
- 45 Ibid.
- 46 See Will, Corn Among the Indians, pp. 141-144.
- 47 Gardner and Larson, Unpublished Data.
- 48 See Will, Corn Among the Indians, p. 197.
- 49 Denig, Five Indian Tribes of the Upper Missouri, p. 49.
- 50 Abel, Tabeau's Narrative of Loisel's Expedition to the Upper Missouri, p. 74.
- 51 Wilson, Buffalo Bird Woman's Garden, p. 113.
- 52 Ibid.
- 53 Ibid.
- 54 Gilmore, "Dispersal By Indians, a Factor in the Extension of Discontinuous Distribution of Certain Species of Native Plants."
- 55 Reid, "*Psoralea esculenta* as a Prairie Resource: An ethnographic appraisal," p. 325.
- 56 Barsh, "Cattle on the Great Plains," p. 106.
- 57 Savory, Holistic Resource Management.

Economics and Ecological Adaptation

In 1830 the villages were a center of flourishing trade. Corn and squash, turnips and hides, flint and shells, guns and horses--all these were routinely traded between Indian tribes on the Plains. Every fall, nomadic tribes rendezvoused at either the Arikara or Mandan Villages, the two economic centers of the northern Plains. To ensure civility between themselves, peace ceremonies were first held. Then began a bazaar of trading, gambling, boasting, singing, storytelling, romancing, and general fraternizing. Acting as intermediaries between far-flung tribes, the nomads connected the Villagers to an economic system that extended literally across the continent.

This was a barter economy, and it formed the larger economic context of Indian agriculture. Obviously it differed in significant ways from the capitalist economies which would later be established on the Plains. Under the barter system, economic activities and relations were at least partially subsumed under social institutions and obligations. In this way, economics was more an extension of kinship than an activity carried out by atomized individuals. Before trading, Indians re-established kinship ties, suggesting that the obligations that applied to kin now applied to one's trading partner as well. However, by 1830 the barter economy had been penetrated by the fur trade, an integration that proved to be a disaster for the Villagers, as we have seen. To understand the barter economy before it was disrupted, we must first appreciate the culture and economy of the nomads, with whom the Villagers traded.

Nomads came to trade from all across the northern Plains. The Assiniboine came from the Northeast, along the lower Red River Valley (in the general vicinity of Henry's trade post); the Crow and the Blackfoot came from the short grass plains to the west; the Arapahoe, Comanche, Kiowa, and Cheyenne came from the southern Plains; and the Sioux, whose many bands moved independently, seemingly came from everywhere. Fleet and fierce, these were, not incidentally, the tribes against whom Custer and the rest of the U. S. Cavalry fought. Of course Custer lost, and so, sadly, did the nomads. As a result of this deadly conflict, and the way mounted Plains nomads were later apotheosized as the defining image of Indian-ness, our understanding of them has been tainted with admixtures of racism and romanticization. Neither can the

nomads be thought of in terms of the Village Indians, for they differed in significant ways.

Unlike the Villagers, the nomads generally organized themselves in bands, loose associations of 20 or more extended families. Of the nomads, the Sioux had an especially well developed and described system of social organization. It linked their many bands, otherwise separated by geography and dialect, into a coherent tribe. Within the tribe as a whole, smaller levels of social organization were contained within it like concentric circles. At the lowest level of social organization was the extended family, who occupied a single tipi and who sat around a common fireplace. As many as one hundred extended families constituted a band, whose tipis at least symbolically formed a circle. The Sioux counted seven such bands, including the Hunkpapa, Brule, and Oglalas. The highest level of social integration was the Seven Council Fires, representing the seven bands, who in totality composed the social universe of the Sioux.¹ Since each level of society ranging from families to the tribe was contained within a larger whole, a sense of relatedness permeated the entire tribe. Even outside of one's extended family, one thus found relatives all around. "Deep within the people, mingling with their emotions," said Luther Standing Bear, "was an inherent sense of solidarity—a tie between one and all others that the nation might be expressed." He continued: "Though each person became individualized... he could not consider himself as separate from the band or nation." With such deeply instilled "tribal consciousness," it is not hard to see why for a Sioux, as Standing Bear put it, "to cut himself off from the whole meant to lose identity and die."²

Just as individuals ostracized from a band would have died, the bands would have similarly perished if the individuals therein had atomized themselves. Within bands, the Sioux valued sharing and reciprocity almost above all else. For them, food especially was to be shared, as Norma Seerley has insightfully observed, since it was crucial in the maintenance of solidarity and equality.³ As with the Villagers, sharing was a necessary way of gaining prestige; by hosting "give-aways," in which goods were redistributed ceremonially, one's prestige and status rose. Like sharing, give-aways were based on the principle of reciprocity, the "moral obligation" to give back what one has been given.⁴ More profoundly, food was in fact considered to be in a category of property all by itself, different from every other form of wealth. It could not be owned by an individual.⁵ In Dakota, the language of the Sioux,

there is thus no way of saying "my food." As Seerley notes, "one can say 'the meat that is in my tipi,' but cannot say 'my meat' any more than one can say 'my mountain' or 'my buffalo'."⁶ Individual accumulation was in this way proscribed for moral reasons, but it was discouraged for logistical reasons as well.

Since the nomads depended on buffalo, bands moved frequently as they followed the buffalo herds. At the height of summer, when the grass was abundant enough to support large herds of horses, and when the buffalo began the mating or "running season," bands congregated, forming large encampments which hunted buffalo and performed the Sun Dance together. Towards winter, as the grass grew scarce, the buffalo herd dispersed, and shelter was to be found only in valleys, the summer encampments similarly disbanded, lowering their ecological demands for wood, grass, and buffalo. To follow the herds, as well as to attack and evade their enemies, the nomads thus needed to move fast and frequently. As opposed to the Villagers, whose property and protecting walls were fixed in place, the nomads found security through mobility. Denig rightly sensed how their mobility limited the nomads from amassing much property: "In this respect they are worse off than the tribes who live in stationary wooden huts as the Mandans, Arickaras, etc., who can and do take good care of provisions." Apparently Denig was unaware of the food preservation and storing which the Assiniboines and other tribes did do, but his following comments come closer to the mark: "Their moving habits prevent the accumulation of much baggage. All useless articles must be thrown away to make room for the more necessary implements. Thus personal property cannot be acquired to any amount."⁷ But aside from such logistical constraints, Denig missed the cultural disincentives to accumulate property, disincentives which cannot be explained so simply by material agency.

But the buffalo were no less elusive to the nomads than they were to the Villagers. By all accounts the nomads also had trouble locating herds, and went to lengths to improve the chances of success. For instance, the only form of institutional hierarchy among the Sioux, the *akichita* or hunting police, was organized during the hunt. The *akichita* demanded strict obedience, so that no one would scare off the herds. Father DeSmet, who had lived with the Sioux during the hunting season, wrote that "anyone who should set fire to the prairie by accident or imprudence, or in any way frighten off the herd, would be sure to be beaten [by the *akichita*]."⁸ Both the *akichita* and the proscription against lighting fires reflect the nomads' orientation vis-a-vis the buffalo, an orientation

which obviously differed from that of the Villagers. Unlike the Villagers, the Sioux and other nomads did not own caches full of food--though at times they acted as though they owned those of the Villagers--and so buffalo was that much more important.

And when buffalo were not close at hand, which was more often than not the case, nomads went far afield to find them. For instance, in 1794 Jean Baptiste Truteau was scouting the Upper Missouri and noted that "the vast prairies, which [the Sioux] cross north of the Missouri, were presently stripped of wild animals and they were obliged to come hunt the buffalo and wild cows on the banks of the Missouri, and even to cross over to the west bank for the hunt."⁹ Adding that they were "lean and skinny," Truteau recorded how in lieu of meat the Sioux "had lived on roots and some wild rice, which they had gathered on the banks of certain swamps which they had passed."¹⁰ Truteau's observation illustrated the fact that even if they had neither buffalo nor caches, the nomads could for a time rest reasonably secure on gathered food, like wild rice. Indeed, compared to buffalo herds, wild plants were relatively dependable, not unlike Villagers' crops.

For this reason the nomads gathered and stored large quantities of a variety of plants, the names of which will now be familiar. Prairie turnips were dug by the women and braided together, providing a food which, as Denig noted, "will support life for several months without benefit of animal food."¹¹ (In fact, prairie turnips were so abundant and nutritious that they were the "most sought after" of all plants by Plains Indians.¹²) Like prairie turnips, ground nuts or "Indian potatoes" were unearthed by women using digging sticks. Among the Dakota the word for summer meant "potato," suggesting its import.¹³ Ground beans made up a large proportion of the nomads' diet, especially in winter. To harvest them, the nomads, like the Villagers, took them from mice caches. However, Clark's earlier intimation of thievery notwithstanding, the nomads placed an equal amount of corn or other food in exchange for that which they took from those whom they called the "mice people."¹⁴ Though such an ideal was perhaps not strictly followed, it nonetheless suggests that the principle of reciprocity so thoroughly permeated their sense of proper economic relationships that it included even rodents. In addition to roots and beans, the nomads gathered great quantities of fruits as well. "Few have any idea, without actual observation, of the immense quantities of cherries and berries eaten by them in season," Denig reported. In moist areas like valleys grew chokecherries, from

which a mix of fruit, fat, and meat called pemmican was made. And there were wild plums and buffalo berries, which Catlin and Tabeau had earlier found growing so plentifully along the Missouri. As Luther Standing Bear remembered, "the most welcome season of the year was the fruit season."¹⁵ Considering their abundance, diversity, and reliability, wild plant foods probably constituted a greater share of nomads' diets than we usually assume. Yet as with the Villagers, when both plant and animal foods were scarce, the nomads went hungry, especially in winter. This, in addition to frigid cold and lack of wood, made winters on the northern Plains into an ordeal. It should come as no surprise, then, that the Sioux recorded their tribal history in terms of the number of winters they had survived.¹⁶

As they roamed widely around the Plains, the nomads knew that the Villagers' green corn was ripe when the flowers of the Blazing Star plant bloomed.¹⁷ Then they returned to the Villagers, hoping to trade what animal and vegetal products they had gathered for the Villagers' crops and other goods. Since they were perennial enemies, between them "trade was often consummated with latent hostility,"¹⁸ as Raymond Wood observes. Yet this enmity was suspended for the sake of conducting trade. An amicable if fleeting truce was reached through the Calumet ceremony, in which the men of the respective tribes adopted each other as father and son. Consummated by gift-giving, the father-son or Calumet ceremony extended kinship between the tribes. Yet unlike exchange within a band or village, which was based on sharing, true gift-giving, and reciprocity, trade between tribes was negotiated and even competitive.¹⁹

At first, Indians included whites in this form of inter-national relations, but in the effort to expand empire whites corrupted these customs. The first instance of contact between LaVerendrye and the Mandan established something of a precedent in this regard. When he first visited the Mandans in 1738, LaVerendrye was duly adopted as a 'father,' and the Mandans accordingly conducted themselves as his sons. Yet neither group understood what the other had in mind. The Mandans, who had known about whites since some of their technologies were already traded, hoped to control the trade which this new and rich nation would certainly generate. But LaVerendrye's motives were as much political as economic. Acting as a representative for the Governor of New France, he sought to extend French dominion into these as-yet uncharted lands and, incidentally, to tell the Indians there who their new king was. So in hearing the Mandans refer to him as 'father,' LaVerendrye was pleased, thinking that his

job as diplomat-conqueror was done. However, little did the Mandan know that he was acting as a representative, such that in adopting him they were as at least LaVerendrye would have it, adopting the Governor as their father. The occasion was not so much a "contact" between cultures as a collision.

Later, in reporting back to the governor, LaVerendrye described "the ceremony of placing their hands on my head [in which the Mandans took] me in Your place as their father and our Frenchmen [his entourage] as brothers, placing their hands on their heads likewise and weeping."²⁰ To codify the newly-established dominion over the Indians, LaVerendrye gave the Mandan chief a lead tablet. As he explained: "This tablet was placed in a box, so that it might be kept forever, in memory of my having taken possession of their lands in the name of the king. It will be well guarded from father to son."²¹ Whereas Indians had used kinship ceremony to suspend conflict, LaVerendrye used it to establish a permanent hierarchy over Indians, thereby nullifying their sovereignty. In so subverting the ceremony, he belied his belief that the French somehow had a right to lay claim to others' land and to control them. Now the Indians, admittedly, did not conduct themselves affably or candidly in relation to other tribes. When LaVerendrye arrived at the Mandan Villages with Assiniboine guides, for instance, the Mandan tricked the Assiniboine into leaving under the ruse that warring Sioux were nearby. LaVerendrye delighted in such subterfuge, but he neglected to appreciate the fact that the Mandan did not want the Assiniboine to enter the villages because if they had done so the Mandan felt they had to be treated as guests, and given copious amounts of corn as gifts. As an errand-boy of the Governor, LaVerendrye was more familiar with duplicity than reciprocity.

In contrast to Europeans' proclivity to build empires, the Calumet ceremony and the treatment of adopted kin reveal a sense of limits, political and ethical. In performing Calumet ceremonies, tribes in effect acknowledged the political sovereignty of other nations, Indian or otherwise, and under the terms reached in the Calumet, behaved accordingly. Likewise, the practice of feeding guests (but not tribes outside the villages) bespeaks of a feeling that in dealing personally with others a certain morality was required, even if they happened to be long-time enemies or hungry enough to deplete the caches. In contrast, LaVerendrye recognized no such political or ethical limits (except those deigned by the governor), and thus felt no compunction in divesting a people of their lands. Tellingly, the tablet LaVerendrye gave the Mandan had nothing written

on it to specify the terms of French authority. It was rather a *tabula rosa* on which whites could later inscribe new and varying terms—which they did. Though the Villagers (and the nomads, for that matter) maintained their sovereignty for about one hundred years after LaVerendrye, his fateful diplomacy in a sense set the terms with which most whites would relate to Indians. In this sense the tablet and its implicit terms prefigure white-Indian relations on the northern Plains: Indian ways were subverted in order to nullify tribal sovereignty, and (at least at first) the terms of dominance could be revised only by whites. In the last analysis, LaVerendrye was more a reflection of his culture than an exceptional individual. Indeed, many of those who later dealt with the Indian nations on the northern Plains were similarly bereft of a sense of political or ethical limits when it came to Indians, seeking instead to extend one form of dominion or another over them. As the secular creed of the American Empire, Manifest Destiny would similarly define Indian-white relations until the late 1800s. It may have bowed to a different leader than had LaVerendrye, but Manifest Destiny had the same effect: the alienation of Indian lands for the sake of expanding empire.

But before it was subverted by whites, barter between tribes was organized by customs. There were more or less agreed-upon rates of exchange for various articles. For instance, one basket of corn might bring one buffalo robe, two packs of dried meat, four arms-length braids of prairie turnips, or one-half a basket of dried chokecherries or Juneberries. Likewise, two arms-length strings of dried squash might bring one buffalo robe, or three packs of dried meat.²² Prairie turnips were also dried and pounded into flour, a staple article of trade. Tabeau saw that the Cheyenne "are rarely without this flour and during the visit that they paid to the Ricaras, they bartered it for maize at a profit of three or four measures for one."²³

The barter economy was widespread, extending across the continent. Wood describes a "pan-continental" network of trade to which local subsystems were joined. The boundaries of these subsystems were delineated by culture areas, such as the Plateau, Pacific Northwest, and the Plains. Within each, trading fairs were held once a year at customary locations. In addition to the Arikara and Mandan, the Shoshone on the Plateau and the Washo and Wasco at the Dalles of the Columbia River annually hosted fairs, serving as the nodes around which the wheel of Indian economics turned. As tribes traveled to and fro from such centers, they effectively created a web of inter-tribal relations, which were at once economic and cultural. As Wood avers, "aboriginal North

America was blanketed by a network of trails and trade relationships which linked, to a greater or lesser degree, every tribe to one or more of its neighbors."²⁴ To the northern Plains, this trade system brought items from such disparate places as the Gulf Coast, the Pacific Northwest, and the Atlantic Coast.²⁵ From the northern boreal forest, it brought moose hides and salt, and from the central Plains it brought wood from the osage orange tree from which bows were made. "The villages of the Missouri River tribes were great trading stations and ports of exchange for the diverse products of regions of great extent," as Melvin Gilmore concluded, "and in this respect resembled the great market towns on the caravan routes of Central Asia."²⁶

This kind of barter complemented a tribes' economy without making them dependent on trade. As anthropologist John Ewers has observed, it served to connect those who produced an article of food or good with those who finally consumed it. At least before the introduction of European trade goods, Plains Indian exchange was mainly in perishables, with the exception of exotic and ritual items which were consumed or used directly. As he says, "barter between hunting and gardening peoples enabled each group to supplement its own economy with the products of the other's labor. It was a mutually profitable exchange."²⁷ Importantly, though both groups benefitted from the exchange, neither was dependent on it, for each could well procure either the animal or plant products for which they otherwise would have traded. "Trade was largely in goods available for both groups," Raymond Wood observes, and so nomads and Villagers "did not depend upon one another for products they did not nor could not produce, except for a few exotic items made from non-local materials."²⁸ In addition to exotic items, the system provided tribes with access to foods or articles in one area that otherwise would have been unavailable in another area, especially due to their ecological distribution. In this way, the trade acted to redistribute items from regions of high productivity to those with low productivity,²⁹ and provided multiple sources (or redundancies) of resources that had variable distributions in time and space.³⁰ Instead of dependence, the trade fostered a degree of specialization whereby hunters did what they did best, be it tanning hides or decorating skins, and nomads did likewise, be it growing corn or making baskets.

If not necessity, what about the trade impelled nomads to ride hundreds of miles, or brought the Villagers to allow their most accursed enemies into their homes? The answer, it seems, lies in the nature of Indian economics. From all

accounts the trading sessions were as much social events as economic transactions. Indisputably, both groups aimed to acquire better-made and exotic items which only the other could supply. For instance the nomads, when pressed by hunger, were known to steal food from the Villagers. But in most years the exchange of goods was but one aspect of a larger cultural event, having much to do about storytelling, gambling, finding potential mates, and renewing friendships. In describing these trading fairs, Denig contrasted times of extreme hunger, when the nomads as much trounced the Villagers as traded with them, to times "when... one [is] well supplied with corn and the other with robes." Then, Denig said,

times are lively, feasting and dancing goes on constantly, both in the village and camp—horse racing, gambling in many many ways. Bucks and belles dressed in their best and tricked out in all the gaudy colours of cloth, paints, and porcupine quills may be seen mingled in the dance or exchanging their professions of love in more solitary places. The old men smoke and eat without intermission. The middle aged exchange horses and other property. The soldiers gamble. And the young warriors spend both day and night in attempts at seduction of the young women in both camps. Strange scenes are witnessed here, much that would be interesting to describe, and more that would be indescribable.³¹

Not surprisingly, the trading fairs acted as avenues through which cultural diffusion occurred. Knowing each other's languages, or sharing a common sign language, tribes picked up each others' stories, religious forms, and how to make tools or new techniques, etc.³² In this cultural milieu exchange itself neither set the terms for exchange nor provided its guiding principles. Rather, Indian economics was based on other kinds of cultural values. For instance, the Mandan required the corn bundle owners to officiate at all trades involving corn, lest the Spirit of the Corn, and thus the power of the bundle, be taken away with the traded corn.³³

The barter economy embodied the ways in which Indians had learned to live on the Plains. Acting to ensure access to resources, increase cultural diffusion, and expand social engagements, the barter economy represented a complex set of adaptations between Indian tribes and their landscapes. What made this adaptation all the more impressive was the short span of time in which it had occurred. In fact, when explorers on the Plains described Plains Indian

lifeways they were not so much capturing, in a snapshot, cultures at their peak of development as they were recording, *in medias res*, a long and continuing dialogue between the tribes and the Plains.

In the 1830s, Plains Indian economics and their ecological effects may have appeared stable, as though both the Indians and the land had so co-existed forever. Indeed, the image which many whites presented of Indians, before they were obviously affected by cultural contact, was of static societies, undergoing little or no changes with respect to social relations, technology, or the land. In such ahistorical descriptions of land use, Indians appear as existing in a state of stable equilibrium. In this respect, such ahistorical presentations of Indians resemble Catlinesque images of pre-contact Indians as being unadulterated, existing in a state of relative harmony before the deleterious changes which contact with whites inevitably wrought. As it turns out, both images distort historical accuracy--the latter by glossing the extent to which "pre-contact" Indians had already been affected by whites long before whites contacted them in person, and the former by glossing the dynamism within Indian societies, especially concerning land use and technology. In particular, neither image appreciated how much the nomads had in the one hundred years preceding white portrayals to the contrary undergone dramatic change. These changes included the westward dislocation of tribes as whites settled farther and farther west, the diffusion of the horse and the gun, and the migration of tribes into the Plains where they adapted to the demands of mounted nomadism and their new environment. The case of the nomads illustrates the dynamism within Indian culture and land use in general but also the relationships between land use, technology, and social organization in particular. To a lesser extent, the Villagers also underwent changes as they adapted to changing social and ecological conditions. But in contrast to the nomads, the Villagers present a case of rather stable cultural adaptation to the Plains, maintaining their social systems and land use practices for the better part of one thousand years.

Before the introduction of horses and the westward dislocation of tribes, many of the tribes who became mounted nomads were living on the eastern or western periphery of the Plains, either as sedentary horticulturalists or as hunter-gatherers. For instance, the Sioux lived in what is now Iowa and Minnesota, and had a semi-sedentary partly-horticultural economy. In all likelihood they, like

the Villagers, were then matrilocal, with women's gardening meeting a significant share of subsistence needs. But in the early 1700s, the Sioux were pushed westward as the Chippewa acquired guns from French fur traders. As the nomadic tribes moved out onto the Plains, they traded with the Villagers to acquire horses. On the Plains the Sioux and other newly-nomadic tribes confronted different environmental, social, and technological conditions than those with which they were familiar. In a word, these included semiaridity, horses, guns, and attacks from other tribes. To these conditions the nomads rapidly adapted.

In response to these shared exigencies, most of the nomadic tribes adopted a similar form of social organization--the band, as we have seen. The band, as anthropologist Symmes Oliver speculates, was uniquely suited to the conditions all tribes met on the Plains, and was thus developed in time by each as a response to those conditions. The band served as a compromise of sorts between smaller or larger units of social organization. On the smaller side were extended families, which could procure enough food for themselves but were vulnerable to attack; on the larger side were whole tribes, which were safe from attack but which too quickly exploited the grass, wood, and shelter in any one area. So the band, larger than families but smaller than tribes, emerged as a nearly universal socioeconomic adaptation among Plains nomads.³⁴ For example, the Crow, once related to the Hidatsa, had a matrilineal kinship system, like the Hidatsa, but in the historic period were apparently shifting towards a band system, like the Cheyenne.

Not surprisingly, the "equestrian revolution" and its related socioeconomic alterations affected other aspects of nomadic life as well. Of these, changes in women's economic roles and social status were striking. As mentioned earlier, before moving on to the Plains and acquiring horses, many tribes were centered around women, both as far as economics and kinship was concerned. But with mounted nomadism, the social and economic orientation of bands shifted to such masculine activities as buffalo hunting, horse stealing, and warfare, with a corresponding decline in the primacy of women's activities. Rather than procure resources themselves, nomadic women thereafter mostly processed resources (aside from plants) which men had procured, the most important of which was of course buffalo. Drying meat, tanning hides, and preparing skins required copious amounts of women's labor. Insofar as men procured but women processed them, access to resources was divided along gender lines--even though

property in land and buffalo were still owned by the tribe collectively--the result of which was a widening gap in the status of men and women. Anthropologist Alan Klein puts the matter bluntly: nomadic womens' status, he says, "took a decided turn for the worse during the nineteenth century, as a direct result of changes wrought by horses." More profoundly, the effects of changing gender and economic relations spun outward, as Klein notes, to affect even spiritual areas of life.³⁵ For instance, in studying Sioux religion, William Powers senses that as the Sioux moved onto the Plains a shift occurred in their mythology from female deities toward male ones, a reflection of the shift in importance from womens' activities, to those of men.³⁶

Clearly, the nomads Catlin and Tabeau recorded were anything but static; from an historical perspective, they had rather undergone fundamental socioeconomic change in adapting to the Plains. Yet many white observers, arriving only decades after the nomads had so adapted, did not recognize the nomads as recent immigrants, a fact that testifies not so much to the ignorance of whites as to the thoroughness with which nomads had already made themselves at home. In contrast to the nomads, the Villagers had by the 1800s a long and relatively stable history on the Plains. Since they first moved into the Plains at about 900-1200 AD, until white diseases and economies devastated them in the late 1700s and early 1800s, the Villagers maintained stable patterns of settlement, technology, and economics. These patterns were based on those they originally imported into the region but were also adapted after they immigrated, especially as cultural traits diffused between tribes. Before immigrating to the Plains, the prehistoric ancestors of the Village Indians lived as horticulturalists in river valleys along the Plains' eastern periphery. Approximately one thousand years ago, during an atypically humid period, the would-be Villagers started moving westward, essentially transplanting their riverine horticultural system into the Missouri trench.³⁷ Based already on riverine horticulture, the Villagers did not have to make fundamental adaptations to their new environment, which, except for lower rainfall, was not unlike the river valleys they left.

Until the 1500s there were two patterns of Plains horticulturalists, one of which was located along such Central Plains rivers as the Republican, and the other of which was along the Middle Missouri. These patterns differed mainly in architectural styles and artifact assemblages (including pottery techniques and ritual items), but probably shared similar economic systems. In the 1500s, a prolonged drought evidently forced the depopulation of the Republican River

villages, for in archaeological sites these abandoned villages are covered by a layer of windblown, eroded soil. At least some of these Republican River refugees moved into northerly stretches of the Missouri (which would not dry up because it is fed continuously by runoff from the Rockies, and has less evaporation due to its shorter and cooler summers). The central Plains traditions at first conflicted with the more-northerly, already settled tribes, as evidenced by the palisades and fortifications protecting their ancient village sites. But as archaeologist Donald Lehmer writes, the contact between the two traditions also involved the "coalescence" or "interweaving" of their two cultures, a hybridization from which the Mandans and Arikara descended.³⁸ The Hidatsa were apparently later immigrants, adopting agriculture as they learned it from the Mandan.

Since immigrating into the Plains, the Villagers' remained in what Raymond Wood has called a "stable equilibrium." This long-term stability can be explained in terms of the Villages' social and economic relations, both of which reinforced the basic patterns of settlement, technology, and land use. Horticulturalism, in contrast to nomadism, entailed dense populations and the associated need to organize more people around common activities like agricultural labor and complex religious ceremonies. In such a socioeconomic setting, clans, in contrast to bands, provide the requisite stability and integration. As we have seen, clans and age-grade societies provided the social forms through which property was kept in trust, rituals and knowledge were handed down from generation to generation, and labor was organized.³⁹ In terms of economic relations, each village was for the most part self-sufficient, and, since resources (except for flint and timber) were uniformly distributed along the Missouri, did not specialize in economic production. Rather, all the villagers focused both on horticulture and hunting, though trade with nomads did perhaps spur them to specialize somewhat in their crops. As a result, trade was "inconsequential" between the villages but essential between villages and nomads, an economic interdependency which leads Raymond Wood to think of the Villagers as being "parts of a much larger system--a system which articulated their technology and trade with those of their nomadic neighbors."⁴⁰

These social and economic relations fostered stable societies. Not only did they exist essentially unchanged for almost one thousand years, but they also withstood severe disruptions. By far the biggest disruptions resulted from the diffusion of horses and the introduction of white diseases and economies.

Horses themselves did not so much disrupt the Villagers as did the nomads who rode them. With horses, the nomads' military superiority was unbridled, as it were, for the Villagers could but cower behind their walls. Indeed, through the late 1700s and early 1800s, the Villagers seem to have withstood more attacks.⁴¹ But even worse than Indian attacks were white diseases and economies. The first epidemic to devastate the Villagers occurred in the 1700s, and a second ravaged them in the 1830s. The insinuation of the fur trade in the early 1800s was another important, but less catastrophic, change which the Villagers were able to weather.⁴² Thus over the course of nearly one thousand years, the Villagers had maintained themselves as farmers, hunters, and gatherers on the northern Plains. And despite the epidemics and economies that would nearly wipe them out, as I shall soon explore, they maintained a modicum of their cultural traditions and agricultural practices until well into the 1900s.

¹ Raymond DeMallie, The Sixth Grand Father, p. 20.

² Standing Bear, Land of the Spotted Eagle, p. 124.

³ Seerley, "A Social System Analysis of the Changing Food Practices of the Teton Dakota Indians, 1800-1900," p. 107.

⁴ Weist, "Giving Away: The Ceremonial Distribution of Goods Among the Northern Cheyenne of Southeastern Montana."

⁵ Seerley, p. 40.

⁶ *Ibid.*, p. 108.

⁷ Denig, Five Indian Tribes of the Upper Missouri, pp. 96-97.

⁸ As quoted in Crawford, History of North Dakota, Vol. 1, pp. 525-526.

⁹ As quoted in Nasatir, Before Lewis and Clark: Documents Illustrating the History of the Missouri, 1785-1804, Vol. 1, pp. 269-270.

¹⁰ *Ibid.*

¹¹ Denig, p. 12.

¹² Wedel, "Notes on the Prairie Turnip (*Psoralea esculenta*) Among the Plains Indians," p. 155.

¹³ Powers, Oglala Religion, p. 49.

¹⁴ See Gilmore, "Uses of Plants by the Indians of the Missouri River Region."

¹⁵ Standing Bear, p. 59.

¹⁶ Jahner, "Stone Boy: Persistent hero," p. 172.

¹⁷ Gilmore, Prairie Smoke, p. 88.

¹⁸ Wood, "Contrastive Features of Native American Trade Systems," p. 162.

¹⁹ Wood, "Plains Trade in Prehistoric and Protohistoric Intertribal Relations," p. 98.

²⁰ As quoted by G. Hulbert Smith, in The Explorations of the LaVerendryes in the Northern Plains, 1738-43, Ed. Raymond Wood, p. 49.

²¹ *Ibid.*, p. 63.

²² Gilmore, Prairie Smoke, p. 88.

²³ Abel, Tabeau's Narrative of Loisel's Expedition to the Upper Missouri, p. 98.

²⁴ Wood, "Contrastive Features," p. 154.

²⁵ *Ibid.*, p. 161.

²⁶ Gilmore, Prairie Smoke, p. 93.

²⁷ Ewers, "The Indian Trade of the Upper Missouri Valley Before Lewis and Clark."

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- ²⁸ Wood, "Contrastive Features," p. 160. (Emphasis in the original.)
- ²⁹ Jeffrey Hanson, "Hidatsa Culture Change, 1780-1845: A Cultural Ecological Approach," p. 40.
- ³⁰ See for instance William S. Abbruzzi, "Ecology, Resource Distribution, and Mormon Settlement in Northern Arizona." American Anthropologist, 91.3 (Sept. 1989): pp. 642-655.
- ³¹ Denig, p. 47.
- ³² Ibid., pp. 164-165.
- ³³ Bowers, Mandan Social and Ceremonial Organization, p. 193.
- ³⁴ Oliver, "Ecology and Cultural Continuity as Contributing Factors in the Social Organization of the Plains Indians," p. 54.
- ³⁵ Klein, "Plains Economic Analysis: The Marxist Complement," p. 134.
- ³⁶ Powers.
- ³⁷ Lehmer, "Climate and Culture History in the Middle Missouri Valley," pp. 117-129.
- ³⁸ Lehmer, "The Sedentary Horizon on the Northern Plains."
- ³⁹ Oliver, p. 56; Bruner, "Mandan," p. 204.
- ⁴⁰ Wood, Anthropology on the Great Plains, p. 8.
- ⁴¹ Meyer, The Village Indians of the Upper Missouri, pp. 86-88.
- ⁴² Jeffrey Hanson, Hidatsa Culture Change, p. 164.

Fur Traders, First White Farmers

Even though whites may have identified more with the Villagers than with the nomads, as I suggested at the outset, much about the Villagers' culture and agriculture nonetheless baffled them. As we have seen, the Villagers' systems of land use, social relations, and economics were based on unique cultural traditions and historical trajectories. To the extent whites appreciated neither their culture nor history, they could not understand the Villagers. Yet the failure of most whites to appreciate Indians resulted from more than mere ignorance, especially in light of the wealth of information about Indians which whites recorded. There were many sources for this misunderstanding, the most obvious of which were racism and greed. Indians were seen in either case as being means to be exploited for other ends, be it pelts, land, or glory. Both sentiments, although certainly not shared by all whites, were common enough to cause tragic suffering. The worst case in this regard was the reckless spreading of smallpox. At least some fur traders knew they were carrying smallpox up the Missouri, but did not stop their steamship nor try to vaccinate the Indians. In 1837 a smallpox epidemic, spread by fur traders, killed all but a few hundred Mandan.¹

Aside from such egregious attitudes, many whites were constrained from appreciating Indians by trying to apply conceptual categories regarding social and economic institutions, deeply instilled in their own culture, to cultures for which they were baldly unsuited. For instance, notions of private property, progress, and economic productivity, all cherished white values, found few analogues in Indian culture. Other sources of misunderstanding were more subtle but no less important. One such source was, as Frederick Jackson Turner suggests, the gulf in spiritual or ultimate meanings that separated Indians and whites. In his Beyond Geography, Turner cogently argues that many whites not only misunderstood but mistreated Indians and the land in large part because Christianity had long castigated both, and at times even lent sanction to their domination. In Turner's view, Christian dogma had been so transmogrified over the centuries that it eventually came to have disdain and contempt for the earth (and much that was associated with it, like the body and Indians), direct spiritual experience, and myth. In place of each, Christianity respectively substituted an other-worldly emphasis, a belief in Jesus as the only prophet (thereby foreclosing the possibility of continuing revelation), and history, or the linear (as opposed to

cyclical) movement of time. According to Turner, these three fundamental beliefs severed Europeans from what he somewhat cryptically calls "life energies"—energies which are to be found in myth, ritual, and nature—leaving them estranged from the natural world. Though this state of estrangement had a long development in Europe, the exploration of the New World made Europeans' estrangement more manifest, since they were then physically estranged from familiar landscapes as well. Upon confronting the New World and its Indian inhabitants, who through myth and ritual had kept in touch with nature, Europeans projected images of dark and even evil forces unto both. From this perspective, the domination of each can be seen as two manifestations of the same spiritual, which is to say deeply cultural, malaise.² Turner obviously makes sweeping generalities in his analysis, yet his case is compelling.

In a similar vein, Morris Berman relates Europeans' estrangement from nature to the rise of what he calls "modern scientific consciousness." Dating back to the seventeenth century, scientific consciousness reified a dualistic conception of mind and body, spirit and matter such that the two were seen as increasingly detached and even antithetical. In conjunction with this bifurcated view of the world, of course, came the predisposition to elevate mind/spirit even as body/matter was denigrated. Such a dualism eventually led to the "disgodd[ing]" of the natural world, whereby mind or spirit was no longer attributed to nature. Nature was then apprehended as being inert matter, and this matter was to be manipulated for whatever ends humans saw fit. In so manipulating nature, its quantities thus become more important than its qualities; and to measure quantities, it was easier to break down nature into its constituent elements. In this way the atomism of the scientific method became the predominant method of knowing nature (as opposed to the holism employed in other approaches). Importantly, this epistemology of nature implied certain roles for science and technology: scientific knowledge was validated to the extent it could make nature conform to human ends, and technology of course provided the means to so control nature. Detached from the observer, devoid of spirit, and designed for (human) use, nature underwent a radical transformation in modern scientific thinking, a transformation which Berman thinks went hand in hand with the development of capitalist economics and industrial society.³

Even if one may not agree with either Turner or Berman, both of their critiques suggest the cosmological differences between Indian and white culture. In other words, the two cultural traditions had fundamentally different ways of

viewing the world, and these differences were related, however subtly, to how members of each cultural tradition practiced agriculture on the northern Plains. In particular, each culture's view of nature and its role in culture and agriculture, and the definition of economic need and the role of goods in satisfying human needs derived in part from the underlying issues which Turner and Berman address. Examining each in turn will help suggest how patterns of agriculture and land use were affected by each culture's deeply-held views of the world.

Both the Villagers and nomads alike thought nature was deeply meaningful. Plants, animals, birds, the earth below and the sky above embodied a common spiritual force, which the Lakota regarded as the Great Mystery, Wakan Tanka. As Luther Standing Bear, a Lakota author, explains, "From Wakan Tanka there came a great unifying life that flowed in and through all things--the flowers of the plains, blowing wind, rocks, trees, birds, animals--and was the same force that had been breathed into the first man. Thus all things were kindred and brought together by the same Great Mystery."⁴ Obviously, in this cosmology no dualisms bifurcated spirit from matter, mind from body: since all the creation was created in and by a shared spiritual source, all living things in the creation were essentially related. The Lakota saw themselves not outside of, above, or inimical to nature, but rather inherently part of it. Importantly, their kinship with nature was fashioned after their notion of proper reciprocal relations between humans, as suggested by the practice of reciprocating an equal amount of corn for the beans which they took from the "mice people." The Villagers similarly felt they had a spiritual kinship with nature, though their myths and rituals expressed it in their unique way. In the Mandan creation myth, for example, people, accompanied by such animals as deer, badgers, and elk, emerge into this earth after climbing up a vine that led through a hole in the ground. The myth reiterates not only that people and animals are in essence related but also that the Mandan are of this earth and come from a place not too far from here.

Following from their recognition of spiritual kinship with nature, Plains Indians sought spiritual aid from nature through engagement with it. For example, seeking visions, men in the nomadic tribes exposed themselves on hilltops for days, where they humbled themselves in hope that Wakan Tanka would take pity on them. If so, Wakan Tanka might help them and thus help their people in some way. Likewise, all the Lakota came together after the Sundance in a congregation of prayer, at which time a few individuals elected to

offer bits of their own flesh to Wakan Tanka in humility and thankfulness. Not coincidentally, Sun Dances were held at the height of summer when the buffalo herds had swelled in size. As a staff of life, the buffalo to the Lakota was especially sacred; it was symbolically associated with the sun, another source of life. The Villagers also went on vision quests but communal ceremonies were the main mode of religious expression, perhaps reflecting the primacy of agriculture. During Mother Corn ceremonies, held in spring and fall, the Villagers prayed to and thanked Mother Corn, who was known as the essential creative source of corn, the bounty of which she alone could bestow. The Villagers maintained right relations with nature through performing the ceremonies according to tradition and having reverence for the spiritual sources of their sustenance, such as Mother Corn. Similarly, the Lakota thought that right relations with nature were maintained by walking what they called "The Good Red Road," the path of health, harmony, and balance.

In contrast, whites saw no such meanings in nature (aside from profits to be made from pelts). With the possible exceptions of naturalists like Lewis and Clark or Audubon, they rather saw nature as devoid of any inherent value. This valuation reflected their dualistic world-view from which nature was seen as objects and people alone are subjects. This *a priori* way of thinking about nature-human interactions, as John Cobb and Herman Daly demonstrate, exerts "immense control" over human activity vis-a-vis nature. As objects nature is mere matter, to be given form by human will and activity. Cobb and Daly spell out the train of thought: "Land not formed by human beings is 'undeveloped,' passively awaiting the actualization of potentialities. It is 'raw material.' Thus, relative to human interest, it is formless. What is formless is empty."⁵

From this perspective, whites thought the northern Plains was "empty" because it lacked the imposition of recognizable human forms--and not simply trees. Aside from being inaccurate--human forms were in fact there since the landscape was subtly managed by Indians--these views meant that in trying to make the land valuable, whites necessarily had to impose their own forms on nature. Left alone, nature was worthless. In light of Turner, it might be more accurate to say that nature left alone, i. e., wilderness, was not so much passive as it was active in the wrong way: As the seat of the dark, even devilish forces, it contradicted white designs, and thus had to be re-formed. The implications of these views of wilderness are brought into sharp relief when contrasted with Indian views of "nature left alone." As Luther Standing Bear explains, the Lakota

did not think of the great open plains, the beautiful rolling hills, and winding streams with tangled growth, as 'wild.' Only to the white man was nature a 'wilderness' and only to him was the land 'infested' with 'wild' animals and 'savage' people. To us it was tame. Earth was bountiful and we were surrounded with the blessings of the Great Mystery.⁶

To inhabit the plains, then, whites thought they had to tame wild creatures and wild land, creating values it otherwise lacked by converting its constituents into other forms, like pelts. In fact the only value most whites (except for a few naturalists) saw in such creatures as beavers, say, was the price of their skin. Decades later, the assumption that nature was relatively valueless until it was transformed by human action would be applied on a grand scale in agriculture. In this regard, one might say that the prairie was plowed under the same sort of dualistic delusions as the furbearers were skinned.

It was obvious to whites that Indians on the Plains were not engaged in capitalism, and it was also clear that there were fundamental differences between capitalism and the kind of economics Indians were practicing. For this reason, in explorers' observations the characteristics of Indian economics emerge in contrast to the capitalism, with which whites were more familiar. Instead of exchange based on abstract forms of value, like money, Indians bartered goods according to customary rates of exchange. Just as importantly, barter was immediate so that only goods in hand could be traded. Since goods to be produced in the future could not be traded for goods in the present, no debt was incurred, and neither was it trusted, as LaVerendrye first noted. Trying to secure guides for his return trip home, he found that "the Indian will give service only as long as he is paid well in advance, and considers promises a subterfuge."⁷ For whites, overcoming Indians' suspicion of debt was necessary in the establishment of the fur trade, in which white traders used debt as a way of compelling Indians to work at trapping.⁸

Moreover, the subsistence orientation of Indian economics--whereby human needs were usually fulfilled but goods were rarely produced or acquired for the sake of accumulation--was also considered by traders as an impediment to getting Indians involved in the trade. Insofar as subsistence expectations and reciprocal relations curtailed the fur trade, traders sought to somehow revise

Indian economics. While at an Arikara trading fair, Tabeau, for instance, made his thoughts on the matter explicit:

On seeing this great gathering of different nations... one surmises that the post would be capable of a large trade; but, on the contrary, this multitude, destitute of everything, is only a burden to the trader, who gives, indispensably and with no purpose, without means of indemnifying himself by trade.

Listing the "reasons that prevent one from hoping that the trade of these nations could be profitable," Tabeau cited the very features which defined the nomads' existence: they "do not dwell very long in the places suitable to the beaver, the otter, and the bear, all animals hostile to the prairies..."; they hunt with bows, not guns or traps; "none... values our merchandise highly;" and finally "they find in the buffalo cow... everything necessary to them and much that is superfluous." In other words, in trying to establish the fur trade, Tabeau and other would-be traders had to convince Indians, whose subsistence economies satisfied their limited expectations, that what whites had to offer was worth working for. Otherwise, they would not engage the traders for, as Tabeau said, "it is evident that with the bow and arrow the savages of the Upper Missouri can easily do without our trade, which becomes necessary to them *only after it has created the needs* [italics mine]."⁹ The trick of the fur trade, then, was to consciously create new and ever escalating "needs" amongst the Indians.

To do so, Tabeau proposed two related strategies. First, "by wise and prudent conduct" whites must gain "the respect of the savages," and "by never deceiving them" such respectable whites will "gain their confidence." Once whites had so "ingratiated" themselves into Indian society, Tabeau's second strategy would soon take effect. "It is not to be doubted," he prophesized, "that custom, intercourse, the spirit of imitation, rivalry, the idea of luxury will give birth among the savages to new needs." No longer would the buffalo supply all the Indians needed "and much that was superfluous," for in due time their rising expectations would surpass that which the buffalo or their traditional lifeways could provide. "The necessity of enjoying [these new needs]," as Tabeau concluded, "will produce the activity required to procure the means for them."¹⁰ In retrospect, Tabeau underestimated the debauchery on the part of fur traders and the dynamism on the part of nomads. For few traders were as trustworthy

as he had hoped, and nomadic tribes were not as staunchly unchanging as he had assumed.

But the most important characteristic of Indian economics, which fur trappers readily observed, was the way in which production and exchange were enmeshed in culture. Within villages and bands, economics was so intertwined in larger social fabrics that economics was in fact but one aspect of said relations, an aspect that neither defined nor dominated other aspects. In this way, notions of proper kin relations set the terms through which goods were distributed in the group. To a lesser degree and more fleetingly, economic exchange between tribes was similarly conditioned by kin relations. The fact that the Calumet ceremony needed to be held before trade began suggests that economics was predicated on being related to and thus in some way responsible for one's trading partners. In this way, Indian economics existed primarily in the realm of society, and not merely economics. So long as Indian economics was still within its cultural parameters, traders realized, they could never quite escape the limits that culture imposed on economic accumulation. Thus as early as 1804, Lewis and Clark noted that in order to wrest control of the trade away from the Mandan and Hidatsa, traders would need to open their own trading posts, separated from the villages.¹¹ Strategically as well as symbolically, taking the fur trade out of the socioeconomic context of the villages constituted a significant shift. The economic systems established at such trading posts as Fort Union or Fort Piegan decreasingly resembled Indian socioeconomic institutions--and increasingly resembled the capitalist economies to which they were linked, however distantly.

Of course, the transition was not a discrete event: it rather occurred over the course of decades and involved hybrid arrangements between Indian and white forms of economies. Indeed, in some ways the fur trade can be seen as an integration of Indian barter and white capitalism: white traders bartered for the pelts Indians had procured, following the traditional pattern, which were then hauled to urban markets. Yet even as it "integrated" with them the fur trade undermined Indian economies. In fact, the success of the traders was the demise of Indians, since enmeshing them in the trade unraveled their own cultures and degraded their means of subsistence. To first entice them into trading, many traders used debt and alcohol, the implications of which most Indians were woefully ignorant. Once indebted or addicted, traders knew that Indians were more likely to bring back furs.¹² Many Indians were in this way manipulated with credit or booze.

Yet other Indians, especially among the Villagers, actively sought to participate in the trade because they realized that the future of their villages as trade centers depended on attracting white traders.¹³ In the end the Villagers may have been too successful in this regard: through the trappers and boatmen, the wealth of the region was communicated to the outside world, and soon "commercially-minded men in St. Louis and the East saw that there were fortunes to be made if the business was placed on an efficient and well organized basis."¹⁴ As fur traders like Tabeau and Henry built their trading posts, they established what would become increasingly capitalistic modes of production, based not on the principles of reciprocity but rather on profitability. Theirs were streamlined economic organizations, designed for the efficient extraction of pelts. And this they did, until they literally trapped themselves out of business, either by flooding the market with so many furs that the price dropped or by eliminating the furbearers altogether. For instance, in 1826, the President of the American Fur Company, John Jacob Astor, aimed to take advantage of high muskrat prices by directing his men to divest as many hides as possible from the Mississippi and Minnesota River Valleys. 550,000 muskrat were killed, of which over 200,000 went unsold because prices plummeted from the glutted market.¹⁵

The ecological effects of such excessive harvesting were unequivocal. Populations of furbearers, like the prices of their skins, soon plummeted. For instance, Lewis and Clark remarked at the high beaver populations through-out the Missouri, made known to them by the loud slapping of their tails in warning. Little more than a generation later, however, beaver populations had declined so much that travelers on the Missouri rarely heard such slapping.¹⁶ Similarly, as early as 1820 beaver had been extirpated from the Red River Valley.¹⁷ Yet the traders could not have cared less: having no stake in the land or people, they had no compunctions in depleting the resources there. When it was no longer profitable to do so, they simply quit the region, leaving a legacy of depauperate fauna and, after the smallpox epidemics they spread, depopulated cultures.

Not all whites were similarly implicated in or impressed by the fur trade, however. Though most trappers had at first come for easy profit, more than a few eventually acculturated themselves into Indian society, either by marrying an Indian woman or simply by living in the villages long enough to learn their languages and lifeways. French fur trappers seem to have been especially willing and adept at ingratiating themselves into Indian culture.¹⁸ Later American explorers, like Lewis and Clark, often met such men in the villages. However,

white men who lived as Indians with Indians were castigated by other whites, who impugned their masculinity by calling them "squawmen." As "squaws" these men were apparently associated more with women and their agriculture and plant gathering than with men and their hunting and trapping. Squawmen engaged in an alternative relation-ship to the northern Plains, one that mixed elements of white and Indian culture. That whites treated them as outcasts reflects the fact that most of them wanted to export the resources of the country (in the form of pelts and hides) rather than acculturate themselves to the country, as the squawmen did.

Squawmen persisted into the late 1800s. For instance, Thomas Roberts, who as a homesteader established a ranch in western North Dakota, mentioned their presence in 1879. That year some squawmen guided him as he traveled from Sioux Falls, South Dakota to Fort Sully, located on the Missouri. "We went across that prairie without a track of any kind," as Roberts described the land. "But the squawmen were just like the Indians, they didn't need a road to know which way to go." And like Indians, as Thomas elaborated, squawmen ate native plants. With their Indian wives, they made pemmican from dried meat and pounded chokecherries, which, as Roberts said, was mixed "together with dried Indian turnips and wild beans that the squaws steal from the ground squirrels' storehouses."¹⁹ By eating such Indian foods as prairie turnips or ground beans, squawmen were in effect adapting to the Plains environment much in the same way as nomadic tribes had themselves done. For instance, as the Lakota had moved west into the more arid Plains, they left behind the forested rivers and lakes that had provided habitat for one of their staple foods, wild rice. Yet on the Plains the Lakota found prairie turnips, which were such a sufficient substitute for wild rice that the Lakota called them something like "wild rice of the prairie."²⁰ squawmen had the acuity to see what the land itself had to offer, and the sense to partake in it.

Unlike the squawmen, most whites refused to eat wild plants--unless forced by starvation--thinking them inferior in quality and taste to European foods. Edwin Denig voiced this sentiment well. In the midst of considering the potential for growing crops, he summarily foreclosed the possibility of using wild foods. "The natural productions of the soil are few and such as no person but an Indian could relish," he proclaimed. In his next breath, however, he then listed all those foods which he knew to be readily available, including "wild turnips, artichokes, service berries, chokecherries, red plums, rose buds,

bullberries, goose-berries, currents, sour grapes...."²¹ All these plants were "relished" by Indians--but to his *cultivated* sensibilities, they were inedible. Only when compelled by hunger did most whites deign to eat wild plants, a pattern which illustrates not only the ready availability of wild foods but also the cultural basis of their use.

George Catlin, for one, was not impressed by the fur trade. To him, its evils were transparent: liquor and newfound greed debauched the Indians, and, through their excessive hunting, depleted populations precipitously. After watching a group of Sioux warriors kill fourteen hundred buffalo so they could trade their tongues for whiskey, Catlin was deeply distressed about the impending doom which he feared faced both Indians and animals if such "profligate waste" continued. Addressing his fellow whites, he lamented, "Oh insatiable man, is thy avarice such! Wouldst thou tear the skin from the back of the last animal of this noble race [of buffalo], and rob thy fellow-man of his meat, and for it give him poison!" Catlin could see the writing on the wall, and bemoaned the likely demise of the Indian and buffalo, which he described as "the joint and original tenants of the soil, the fugitives together from the approach of civilized man." He was particularly distressed that these cataclysmic impacts were not considered by his fellows as a case of greed on a continental scale. It was rather to be considered to be one further step in the march of civilization, a march which implicitly asserted that, as Catlin realized, "power is right, and voracity a virtue; and that these people, and these noble animals, are righteously doomed to an issue that will not be averted." Sensing how knowledge could be shrewdly manipulated in the service of avarice, Catlin observed ominously that the benefit of expanding empire can be "proved," for, as he put it, "we have a civilized science that can easily do it, or anything else that may be required to cover the iniquities of civilized man in catering to his unholy appetites." With this same science, Catlin added that "It can be proved that the weak and ignorant have no rights--that there can be no virtue in darkness--that God's gifts have no meaning or merit until they are appropriated by civilized man--by him brought into the light, and converted to his use and luxury...."

Deeply troubled by the prospects of nature and Indian culture, and certain that nothing less could forestall the impending doom, Catlin broke radically from his fur-trapping fellows. To halt the further expanse of white civilization, Catlin called for the establishment of a park, where, as he said, "the world could see for ages to come, the native Indian... amid the fleeting herds of elks and buffaloes."

Extending from Lake Winnipeg to Texas, the boundaries of this reserve were to be a bulwark against white civilization and a defense of those inside from what Catlin saw as its corrosive effects. With his proposal, Catlin was the first American to suggest the creation of a national park (the first would be Yellowstone, following fifty years after Catlin's clarion call).²² As a plan to protect Indians and the land in their "pristine" state, Catlin's park belies two related notions regarding culture and land use. The first was that such a pristine state existed among Indians, as we have seen, and the second was that white civilization operated according to some already determined and diabolical dynamic. Both presumptions are historically suspect, yet Catlin's park may have been a strategic success insofar as it could have thwarted the oncoming conflicts between whites, Indians, and the land, like the smallpox epidemic of 1837 or the later extirpation of buffalo. Even though his plea was unanimously ignored at the time, it has nonetheless persisted as an alternative pattern of land use.

A less obvious but related effect of the fur trade was to encourage the adoption of agriculture, both among Indian tribes and whites. Especially along the northeast periphery of the Plains, many tribes who had formerly hunted and gathered for a living started farming about 1820, as the populations of game animals dwindled and fur trappers sought to acquire foodstuffs from the tribes. In response to these changing conditions, the Chippewa, Ottawa, and Algonquin Indians started small-scale gardens, the produce from which they used instead of animal foods as well as to trade to trappers. The destruction of animals' populations and the creation of markets thus combined to spur the spread of agriculture. This expansion took Indian agriculture to its most northerly limit on the continent, a location hundreds of miles north of the Villagers. The crop varieties in these gardens, as it turns out, came from the Village Indians: they had been traded to more-northerly tribes before reaching the tribes who eventually planted them.²³

The first whites to farm on the northern Plains were also the least willing to farm. At trading posts (and later at mining camps and military forts), whites found themselves terribly isolated from the outside world. With only horses and steamboats for transportation, they had limited access to all products, especially perishable food. Transportation costs simply prohibited the importation of perishables on a regular basis. The isolation of gold mining camps in Montana Territory—and the effect it had on miners' food supplies—was indicative. During

the hard winter of 1864-5, food stores were so depleted that a 100 pound sack of flour escalated in price from \$20 to \$120.²⁴ Yet the lack of food which the first whites suffered was not so much a result of their location as a function of their estrangement from that locale.

Vegetal foods were to be had in the area itself: Indians had relied on wild plants, especially during the winters. Even though many whites knew which plants Indians used, and at some point had probably tasted them, most refused to eat them, castigating them as inferior and ruddy as the Indians who did eat them. In this light, food scarcity was in part an artifact of whites' perceptions--and not material conditions, as they complained to themselves. The foods were there if only they, like squawmen or Indians, could recognize their value. Decades later, the way whites denigrated wild plants, and the related commitment to supplanting them with European crops,²⁵ led in part to the plowing of the prairie for the sake of making it "productive." But in the meantime trappers, miners, and cavalrymen farmed like Indians.

Like the Indians' villages, the posts, camps, and forts were located in or near river valleys. There whites farmed lowlands intensely and grazed their livestock extensively on the uplands. In their garden-like plots they grew European crops, including potatoes, cabbage, carrots, turnips, beets, lettuce, etc. At the thirty or so forts across the region, soldiers grew everything from corn to parsnips, melons to potatoes. Their biggest garden was over 26 acres. The yields were sufficient to support the troops, with reports of hundreds of bushels of potatoes and other vegetables not infrequent.²⁶ Henry's journal gives a sense of the diversity and abundance of crops grown. In October of 1803 Henry wrote:

Snow. I took my vegetables up--300 large heads of cabbage, 8 bushels of carrots, 16 bushels of onions, 10 bushels of turnips, some beets, parsnips, etc.... [Three days later] I took in my potatoes, 420 bushels, the produce of 7 bushels, exclusive of the quantity we have roasted since our arrival, and what the Indians have stolen, which must be at least 200 bushels more. I measured an onion, 22 inches in circumference; a carrot, 18 inches long and, at the thick end, 14 inches in circumference; a turnip with its leaves weighed 25 pounds and the leaves alone weighed 15 pounds. The common weight is from 9 to 12 pounds, without the leaves.

The following year, after another successful season, Henry recorded similarly impressive yields: "The men had gathered the following crops: 1,000 bushels of

potatoes (produce of 21 bushels); 40 bushels turnips; 25 bushels cucumbers; 2 bushels melons; 5 bushels squashes; 10 bushels Indian corn; 200 large heads of cabbage; 300 small and Savoy cabbages."²⁷

Like other fur traders, Henry planted Indian crops.²⁸ Directly or indirectly, they obtained the seeds for these crops from the Villagers. Yet not only did the trappers grow Indians' locally-adapted crops, some of them acted to disperse Indian varieties as well. For instance, after visiting the Villagers, Alexander Henry traded some of the seed he received from them to other tribes who, as a result of living far to the east and north, had infrequent contact with the Villagers. As mentioned earlier, these tribes were in the process of adopting agriculture in response to the changes in ecological and economic conditions, changes wrought by fur trade.²⁹ This kind of sharing of agricultural techniques and crops was an important though little-known continuity between white and Indian agriculture.

Certainly white farmers employed different practices than those of the Villagers. At Montana gold camps, for instance, miners built irrigation systems, with which they watered grains, potatoes, and hardy fruits. "Prospectors became farmers, and carried to the new occupation their knowledge of sluice construction and simple irrigation systems."³⁰ Aiming only for subsistence and small-scale commercial sales, these irrigation projects were small and did not involve wholesale alterations of river basins. And unlike in the Villages, the focus at the posts, camps, and forts was on everything but farming. Alexander Henry described on April 30th, 1804, the activities at his fort at the mouth of the Pembina, activities which were hardly amenable to agriculture:

Indians having asked for liquor, and promised to decamp and hunt well all summer, I gave them some. Grande Gueule stabbed Capot Rouge, LeBouef stabbed his young wife in the arm, Little Shell almost beat his old mother's brains out with a club, and there was terrible fighting among them. I sowed garden seeds.³¹

In light of the savagery with which he was all too familiar, it is not surprising that Henry, upon visiting the Villagers two years later, found the women gardening "industrious" and, as mentioned earlier, "the whole view... agreeable... [with] the appearance of a country inhabited by a civilized nation than by a set of savages."

Whites' early grazing practices were also remarkably similar to time-tested Indian patterns. During the summer months, herds of horses and cattle were grazed widely on the uplands, and, just as importantly, the herds were moved to take advantage of areas that had good forage quality. From their winter camp, Sarah Canfield recorded that in early May of 1868 her husband, after having scouted the country for good pasturages, "started this morning with twenty-five mounted men to drive beef cattle to the mouth of the Mussellshell where a summer camp, in tents, is to be established."³² In so moving their herds according to seasonal and regional variations in grass productivity, they were effectively (if not intentionally) replicating the way buffalo herds moved in search of greener pastures. Further, in themselves moving seasonally to be near their herds, they were effectively adopting the time-tested nomadic practice of following the herds, though we can safely presume that the cavalry held no Sun Dances at their summer camps. In addition, while the livestock were still on summer ranges, wild hay was cut for winter feed. Whites recognized the forage value of the tallgrass species which grew profusely in the valleys. For instance, as one observer at Fort Union remarked, the "beautiful bottom prairie [is] covered with a sort of blue-stemmed grass said to be of the best quality which the country produces for winter fodder. There are some two or three hundred areas which are fit for mowing."³³ This grass, so beautiful and blue, was probably Big Bluestem, one of the many tallgrasses early ranchers cut for winter feed.

Once small-scale agriculture had been established, its expansion was curtailed by the same lack of transportation that had encouraged subsistence farming in the first place. For instance, the first farmers at the Red River Settlement, which was located in the northern Red River Valley, faced almost insurmountable obstacles in getting farm supplies, such as seed or sheep breeding stock, from outside the region. In the long winter of 1820, after having had to eat even their seed wheat, men from the settlement had to snowshoe 500 miles to get more seed to plant in the spring. They learned the hard way why the Hidatsa saved at least two years' worth of seed. Even more remote were the sheep: in 1832 men from the settlement walked over 1,000 miles to Kentucky, where they bought 1,300 sheep and lambs. Not surprisingly, little more than 200 of the sheep made it back.³⁴

Military forts faced the same transportation problem, but, with government support, were seemingly able to import more food than the fur trapping or gold mining companies were willing to pay for. Sarah Canfield, who

had since moved with her lieutenant husband to Camp Cooke in Montana, located two hundred miles from Helena, reported on the first of October 1866 that "one of the late boats brought from the Gallatin Valley some fresh vegetables for which they charge \$6.00 per bushel for potatoes, 30 cents a pound for cabbage, other vegetations in proportion. We live mostly on canned goods of which the govt. supplies an abundance."³⁵ Similarly, at Fort Ransom on the Sheyenne River, Major G. H. Crossman recorded that the army imported vegetables like cabbage, turnips, and potatoes from other settlements.³⁶ But despite these imports, the army directed each fort to provide as much of its own produce as possible in the hope of reducing its expenditures for transportation.³⁷

Despite the obvious socioeconomic differences, the farming styles of early whites and Village Indians were similar in significant ways. Both were adapted to the two major ecological zones of the Plains, with farming in the valleys and grazing on the grasslands. Both employed intensive cultivation, which relied on few external inputs, to meet subsistence needs as well as to engage in barter. Indeed, to the extent such techniques resembled Indian ones, white "farmers" in the early and middle 1800s developed ecologically-adapted agricultural systems. Perhaps most importantly, they had sober expectations for farming the semiarid plains: they took full advantages of its opportunities but also acknowledged its ecological limits. For instance, though Henry was bullish on his beets, he never once thought that his success in the valleys could be generalized, that is, applied to other ecological areas. To him and other trappers, agriculture would need to stay where soils were rich and moisture dependable, like along river valleys.³⁸ Denig was likewise restrained in his estimation of the region's agricultural potential. Even though he naively presumed that the supply of "the grasses of spontaneous growth" was "inexhaustible," Denig did recognize other limits imposed by semiaridity on stock raising and agriculture. For livestock, the limits were in the form of winters and, as he said, "the great number of wolves roaming about [which] would form an objection." Yet cattle and especially sheep could be raised, he averred, "if animals were housed and provided for during a month or two during winter." Denig's suggestions regarding the winter needs of cattle, as well as his observations regarding the predatory habits of wolves, were prescient.

For agriculture, Denig identified rain and insects as the biggest limits. "By exiprements made near Fort Union," he reported, "it has been ascertained that oats, corn, potatoes and all garden vegetables grow well in favorable seasons."

Explaining what made a season "favorable," Denig continued, "the soil being light and sandy requires frequent rains to produce good crops, which happens about one year in three, the other fall from drought and destruction from grasshoppers, bugs and other insects."³⁹ In retrospect, few white farmers were as restrained and honest with regard to the limits to agriculture on the Plains as Henry, Denig, and other trappers were. In the decades following them such reason and honesty were thrown to the wind as the land was farmed with more ambition and less restraint.

But because trappers, miners, and army units did not intend to farm, theirs was one of the most fleeting phases of agriculture on the northern Plains. After the beaver were trapped out, the gold mined, and the Indians conquered, most of those who formerly farmed incidentally stopped farming altogether. Unfortunately, as their legacy the northern Plains was left not with the repertoire of the skills and practices which they learned as farmers but rather with the machinations they had had as trappers, miners, and soldiers. Their machinations would soon have a bonanza on the northern Plains while their practices would all but fade away, leaving almost as little impression on future farmers as they had formerly made on the land.

¹ Meyer, The Village Indians of the Upper Missouri, pp. 90-91.

² Turner, Beyond Geography: The Western Spirit Against Wilderness.

³ Berman, The Reenchantment of the World.

⁴ Standing Bear, Land of the Spotted Eagle, p. 193.

⁵ Cobb and Daly, For the Common Good, p. 192.

⁶ Standing Bear, p. 38.

⁷ As quoted in G. H. Smith, The Explorations of the LaVerendryes, p. 61.

⁸ Woolworth, "The Sisseton-Wahpeton Dakota Indian Fur Traders, 1820-1838," p. 19.

⁹ Abel, Tabeau's Narrative of Loisel's Expedition to the Upper Missouri, p. 72.

¹⁰ *Ibid.*, pp. 165-166.

¹¹ Ewers, "The Indian Trade of the Upper Missouri Valley Before Lewis and Clark," p. 33.

¹² Crawford, History of North Dakota, p. 71.

¹³ See Roger Nichols, "The Arikara Indians and Missouri River Trade: A Quest for Survival," Great Plains Quarterly 12.2 (Spring 1982): pp. 77-93.

¹⁴ Nelson, Land of the Dakotahs, p. 55.

¹⁵ Woolworth, p. 19.

¹⁶ Cutright, Lewis and Clark: Pioneering Naturalists, p. 133.

¹⁷ Woolworth, p. 18.

¹⁸ The Metis, a population of French and Chippewa descent, suggest the extent to which French and Indian cultures merged.

¹⁹ Roberts, "Pioneer Life in Western North Dakota," pp. 159-161.

²⁰ Gilmore, "Uses of Plants by Indians of the Missouri River Region," p. 56.

²¹ Denig, Five Indian Tribes of the Upper Missouri, p. 68.

²² Nash, The American Environment Readings in the History of American Conservation, pp. 5-9.

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- ²³ Moodie and Kaye, "The Northern Limit of Indian Agriculture in North America."
- ²⁴ Hargreaves, Dry Farming on the Northern Great Plains, p. 27.
- ²⁵ Welsch, "Sorry Chuck--Pioneer Foodways."
- ²⁶ Freedom, "Military Forts and Logistical Self-Sufficiency on the Northern Great Plains, 1866-1891."
- ²⁷ As quoted in Crawford, p. 70.
- ²⁸ For instance, the James Bordeaux Trading Post in Nebraska also grew Indian-style gardens. In fact, they have maintained these gardens to this day, serving to educate the public about this otherwise invisible phase of white agriculture, as well as to keep Indian seed varieties viable. See Charles E. Hanson, "The Indian Garden Project," in the 1984 Fall Harvest Edition of Seed Savers Exchange (Decorah IA: Seeds Savers Exchange): pp. 136-140.
- ²⁹ Moodie and Kay, p. 519.
- ³⁰ Hargreaves, p. 28.
- ³¹ As quoted in Leechman, "I Sowed Garden Seeds," p. 25.
- ³² Canfield, "An Army Wife on the Upper Missouri: The Diary of Sarah Canfield, 1866-1868," p. 216.
- ³³ As quoted in Wishart, "Agriculture as the Trading Posts on the Upper Missouri Prior to 1843."
- ³⁴ Leechman, "I Sowed Garden Seeds," pp. 35-36.
- ³⁵ Canfield, p. 214.
- ³⁶ Letter from Crossman, dated 9 Oct., 1895. Copy on file at the North Dakota Historical Society Collections. File number B 189.
- ³⁷ Freedom, pp. 4-11.
- ³⁸ Crawford, p. 72.
- ³⁹ Denig, p. 68.

Wheat Bonanza to Buffalo Bones

Until the late 1800s the further expansion of white agriculture was limited by two main factors: the absence of railroads and the presence of a Desert. By the 1870s homesteaders had started moving into the eastern fringes of the northern Plains, where, facing the characteristic ecological exigencies of scarce wood and water, they first settled in river valleys.¹ There they also faced the same isolation which trappers, miners, and cavalry had encountered, and so their agriculture was similarly circumscribed by transportation difficulties as well as the uncertainties involved in farming the uplands. Still having but oxcarts and riverboats for transportation, little or no grain was yet grown for export.² At this early date settlers were simply concerned with surviving, no mean feat in an alien land with little or no social or technical support. From this perspective it is not surprising that they were extremely hesitant to attempt to farm the uplands, where ecological uncertainties, and thus economic risks, abounded.

As late as the 1870s outsiders were similarly wary about widespread farming on the Plains, though for different reasons. To farmers, the Plains constituted a risk; to outsiders, the Plains was still seen as a desert of sorts.³ When Catlin proposed protecting the Plains as a national park, for instance, he did so under the impression that because the area "is almost one entire plain of grass, [it] is, and ever must be, useless to cultivating man."⁴ Decades later, after he had commanded his outfit there, General Alfred Sully reached a similar conclusion. "I would not recommend it as a good country to settle in," he reported, for "large portions of it can never be inhabited, not even by the Indians."⁵ Not understanding nomadism, Sully thought unoccupied land was unused land, and thus mistakenly concluded it was unusable in any way, especially for farming. Not all had such dim (or misinformed) views regarding the agricultural potential of the Plains, but until the late 1800s they were so generally accepted as to discourage farmers and land speculators from plying their trades there.

Before the desert was to retreat, the railroads had to advance. By 1872 the Northern Pacific Railroad had crossed the Red River, and other lines soon entered the region as well. Railroads left an indelible imprint on the settlement of the northern Plains. Unlike on previous frontiers, where settlers were long established before the coming of railroads, trains now preceded settlers.⁶ As

state historian Lewis Crawford says matter-of-factly, "the settlements followed railroads."⁷ Whole towns were in fact built around the railroad: in contrast to the settled East, where towns centered around a central square, in the Plains towns were spread along the tracks that had just been laid. Since railroads were the best link to outside markets, and a source of investment and settlers, early pioneers and boomers had great expectations for them. In many cases the quick growth of their towns--not to mention the rapid rise of their land values--was at stake. For this reason the coming of the railroad was a momentous occasion, suffused with a host settlers' aims and anxieties. As one settler expressed the prevailing attitude:

When rumors of a railroad started, it was something like the discovery of oil.... It does something to one--brings out some sort of expectancy of great possibilities, soon or in the distant hazy future--keeps one going high. Everybody was wondering where the railroad would come, and when.⁸

To Plains settlers the railroad was thus an irresistible technological advance, the purveyor of progress into an otherwise isolated, wild, and forbidding landscape. Where before the land was barren, railroads brought civilization, literally and figuratively.

As a symbol of the ongoing Industrial Revolution, the railroad likewise enchanted many nineteenth-century Americans, wherever they may have lived. Yet according to Leo Marx, for many at the time the railroad was an ambiguous symbol, evoking trepidation as well as glorification with respect to industrialization. On the one hand, it stood for all that industrialism had to offer, including material progress, efficiency, control over nature, etc. But on the other hand the noisy, dirty, and invasive trains seemed to threaten the relative harmony and bucolic imagery of long-settled rural areas. Thus the set of responses one had to "the machine in the garden," as Marx put it, varied according to one's orientation vis-a-vis industry and the agrarian idyll. Yet on the unsettled Plains, the railroad was only glorified as the vehicle for progress, industrial-style. In contrast to the settled East, where the likes of Thoreau or Hawthorne pondered the deleterious consequences of this new and powerful beast, on the Plains the train carried with it none of the reservations regarding its possible impacts on the rural idyll. For on the Plains there was as yet no rural society, idyllic or otherwise. (Indians were of course ignored.) Rather than upset

long-established rural life, as some feared they had done in the East, railroads shaped Plains settlement from the start, a fact that suggests the degree to which industrialization and agriculture were to be coterminous on the Plains.

Settling the Plains, as Walter Prescott Webb observed, was possible only by dint of such industrial technologies as the railroad, windmills, hardened plows, barbed wire, repeating rifles and better pistols.⁹ Yet the influence of industrialization on Plains settlement and agriculture was more systematic than simply supplying the requisite toolkit. As William Cronon demonstrates in Nature's Metropolis, the frontier in the late 1800s was inseparably connected to burgeoning centers of industry, transportation, and capital, the most important of which was Chicago. By charting the flows of resources like timber, cattle, and wheat from the expanding frontier back to the growing hub of Chicago, Cronon shows how patterns of settlement and land use were in large part shaped by the logic of markets.¹⁰ Needless to say, capitalists in Chicago did not even pay lip service to notions of reciprocity in their economic transactions. Rather than kinship, capitalism had to do with profit. And in the socioeconomic context that was late nineteenth-century Chicago—a context which would increasingly include rural hinterlands under its auspices—people aimed to accumulate capital regardless of how doing so impacted human or natural communities.

Here indeed was a great transformation, as Karl Polanyi put it. In the transition from precapitalist to capitalist economic systems, Polanyi argued, production and distribution were severed from precisely the sort of cultural linkages which had given them meaning in Indian economics, and were increasingly defined by the logic of capitalism. It would be hard to over-emphasize the importance of this shift, for it reconstituted the nature of economic exchange as well as all the components involved in it. As Polanyi says, separating land and labor from cultural contexts "means to subordinate the substance of society itself to the laws of the market."¹¹ In addition to radically transforming people and their labor, as Polanyi and others have demonstrated, capitalism similarly commodified land as merely another input in production. As Theodore Steinberg argues, the commodification of nature played a key role in the industrialization of capitalist economies. Whereas in most cultures natural entities had previously been embedded in webs of aesthetic, social, and economic meaning, industrialization involved a "long process whereby nature was conceived as discrete bundles of commodities—of wood, land, and water. The

industrial revolution redefined the environment; it was now a 'natural resource.'"¹²

The commodification of nature in effect severed the extraction and use of natural resources from all but economic considerations. Nature existed for human use, and nineteenth century Americans were going to put it to use as fast as possible. Phillipe deTrobriand expressed this view of nature-as-resources succinctly. As he surveyed the northern Plains in the 1860s, he recorded the features of what was as much his own inner landscape as that landscape around him. "More than anything else," he said, "it is an impression of immensity, of open space, and of *an individual left to his own resources in the midst of nature where nothing belongs to anyone and everything belongs to everyone.*"[italics mine]¹³ In a phrase deTrobriand nullified Indian ownership of land and resources, and opened the region to whites, as individuals who could exploit its seemingly limitless resources. What deTrobriand in effect enunciated was the creation of a commons where, in contrast to previous Indian common property arrangements, no cultural proscriptions limited individuals' use of resources. Without any such cultural limits, resources held in common were depleted in short order, as shall be made abundantly clear.

In addition to redefining the meaning of labor and land, the logic of industrial markets altered the socioeconomic landscape. As far as the northern Plains is concerned, these markets were driven by two particularly important dynamics: economies of scale and the related geography of centers and peripheries. In the emerging socioeconomic context of industrialized society, these two dynamics would especially transform the social and ecological landscape on the northern Plains. The effects of economies of scale were straightforward but nonetheless profound. In theory, economies of scale accrue to larger operations insofar as they can maximize the efficiency with which they produce, transport, or process a given good. Increasing efficiencies should simultaneously decrease prices paid by consumers and increase profits made by companies. Its ostensible economic advantages notwithstanding, such economies of scale, when sought in almost sectors of the economy, put smaller firms at a disadvantage in large markets. As Cronon documents, large firms could and did undercut the prices of smaller firms—but not simply because of economies of scale. With their greater accumulation of capital and their larger volume of sales, many of Chicago's larger firms intentionally sold goods at a loss in smaller towns across the Midwest. Unlike their small competitors, however, large firms could

afford these "loss-leaders," and maintained them until many smaller firms went under. In this way many local butchers, bakers, and other small businesses were forced out of business, while capital accumulated even further in Chicago.

What these kind of market dynamics meant for places like the northern Plains was that in the main, such extraction-based industries as ranching, mining, and agriculture would occur there, whereas transportation, processing, and redistribution would fall under the orbit of ever-larger urban areas like Chicago. Since most of the profits from such resources as meat and wheat derive from retail sales (not primary production), ranchers and farmers on the Plains were to be increasingly dependent on markets over which they had little if any control, and by which they made but few profits.

For this reason, "the great transformation" on the northern Plains involved not only a reconstitution of the nature of economic activity but also a dislocation of its center. Whereas the center of Indian economics had been located within the northern Plains, i. e., at the Villages, with the fur trade the center started moving elsewhere. At first this movement was subtle--in fact, the fur trade in some ways integrated with previous trade patterns--but it later became dramatic when railroads linked the region to distant centers of capital, commerce and transportation, like Minneapolis and Chicago. By then it became appropriate to speak of urban centers and vast rural hinterlands. From the outset of settlement, the northern Plains was utterly dependant on the transportation and capital flowing from such urban centers. So long as commodity prices were high, and rains plentiful, the region did not seem to suffer so much from this dependency. But as soon as either prices fell or crops failed, the dependency became poignant. Within less than two decades, the systematic inequity of this relationship so angered Plains residents that they began seeing themselves as colonies of Minneapolis and Chicago.

Bonanza farms in the Red River Valley epitomized the industrialization of agriculture. Of all the phases of farming on the northern Plains, none was as closely enmeshed in industrialized forms of organization, reliance on technological innovation, heavy capitalization, and commodification and exploitation of the land as were the Bonanza farms. After investing heavily in new track construction, investors in the Northern Pacific Railroad went bankrupt during the Panic of 1873. To repay their creditors, the investors sold land--land which was originally granted to them by the government--to other investors, few of whom ever saw the land, let alone cared for it other than for financial

reasons.¹⁴ Though they cared not a whit about the land or agriculture, the investors got into both with a vengeance. Their holdings were huge and highly capitalized. Many Bonanza farms encompassed more than ten sections--over six thousand acres--and a few had as much as thirty thousand acres.¹⁵ The land they amassed was fertile and flat, and the investors speculated that they could convert its natural potential into human capital through what became for them the business of agriculture. To do so they hired professional managers, who as "farmers of fortune" organized the Bonanza farms along business lines. Accordingly, bonanza farms were heavily capitalized, employed the latest in agricultural technologies, and hired mostly transient laborers. They were farming factories, an early and extreme instance of agribusiness. The only thing they shared with the Villagers was the raising of crops.

Bonanza farms radically simplified and disturbed the tallgrass prairies. In place of such perennials as Big Bluestem, Indian grass, and Cordgrass, now there was wheat, wheat, and more wheat. And unlike the disturbances which maintained the prairies, the disturbances which maintained wheat monocultures were extreme and incessant. Of course the first of these disturbances was plowing up the prairie itself, an act of profound ecological import. Until Bonanza farmers and homesteaders boldly moved out onto the uplands, Plains farmers, be they Indians or trappers, had cultivated only alluvial soils, which were somewhat protected from extreme climatic conditions and annually disturbed by flooding. In contrast, the uplands were exposed to more extreme wind and temperature fluctuations, and were episodically disturbed. Thus plowing the prairie initiated a new and portentous kind of agriculture, one which in time radically altered the Plains environment. Many of these changes were apparent shortly after plowing, but many others were only apparent years later, after the effects of many subtle changes became cumulative.

Plowing destroys the existing plant community and exposes the soil to the atmosphere. In natural prairie, the plant community acts to moderate the interface between the atmosphere and the soil. Light, air, and water all in one way or another pass through plants before affecting the soil. Except after occasional disturbances, prairie plants are perennially there to protect the soil, as it were, from what can be the deleterious impacts of each. In the prairie, as ecologist John Weaver explains, vegetation "forms an intricate series of minute dams and terraces which tend to hold the water until it can percolate into the soil." With percolation, little rain runs off, such that "surface erosion and gullies

are not features of the prairie."¹⁶ Vegetation similarly arrests the movement of air, namely, wind, across the soil and moderates the fluctuations of temperature, both of which act to decrease the amount of moisture that evaporates from the soil as well as wind erosion. Even if vegetation is for some reason removed, as with fires or trampling, their extensive root systems remain. "Prairie soil is always filled with living roots and rhizomes, decaying plant parts, and the network of channels left by them. Organic matter is very high, often about five per cent by weight...." This healthy soil structure and composition changed little when vegetation is removed--so long as the root system was not disturbed.

Plowing does just that, however. By uprooting the sod and exposing the soil, plowing alters ecological conditions above and below the soil horizon, as well as those occurring at the interface between the two. Wind and temperature fluctuations increase, leading to more evaporation and wind erosion. Without plants to soften their impact, "raindrops beat upon the soil like millions of little hammers. The soil is compacted [because] the cohesive force between the soil particles is lessened as the surface becomes muddy" and the pores within the soil are filled with broken-down soil. In this way the ability of the soil to absorb moisture is reduced, "[and so] the excess water accumulates on the surface and on running removes with it the surface soil particles." Within the soil, the root system degrades, decreasing soil structure and the organic matter is slowly mineralized, which in turn decreases the remaining root of soil nutrients. All told, these processes mean that with continual plowing the soil is left less resilient and more degraded by erosion and compaction. The benefits of cropping notwithstanding, these are some of the "losses incurred in cropping," as Weaver describes them. "They are part of the price," he concludes, "civilized man pays for replacing the stable crop evolved by nature by the unstable ones he selects."¹⁷ Yet if plowing destroyed the natural prairie, it also created new (agronomic) environments, namely, monocropped fields. The ecology of monocropped fields would thereafter constitute a set of material conditions to which farmers had to somehow respond, either through further alterations to the environment or by adapting themselves and their institutions.

In addition to Bonanza farming in the eastern, tallgrass prairies, railroads encouraged buffalo hunting and cattle ranching in the western Plains. By the mid 1870s, when railroads had reached as far west as the northern Plains' great buffalo herds, the herds on the southern Plains had already been slaughtered by professional hunters. The same hunters, not surprisingly, next moved north,

training their sights on the last remaining herds. In only a few years they exterminated thousands of animals in what at first appears to be a melee of avarice and abandon. By 1884, hunters had extirpated nearly all the buffalo: only a few hundred survived.¹⁸ The nomads were of course horrified by the slaughter of buffalo. Not only did white hunters kill far too many, but they also wantonly wasted all but their hides or tongues, an anathema to Indians' frugal use of buffalo. No wonder that the Sioux word for whites, *wasicu*, which originally denoted whites' almost god-like ingenuity, eventually meant "fat-taker," connoting the greed for which whites' ingenuity was often employed.¹⁹

Yet the buffalo massacre, apparently perpetrated out of the hunters' sheer greed, was at once more and less sinister than that. It was more sinister, on the one hand, because the nomadic Indians were an intended target of the attacks. Officers in the U. S. Army, there to "pacify" the Indians after their recent Civil War victory, knew that since the nomads depended so heavily on herds, delivering a blow to the herds would in effect deliver a blow to the nomads. As a professional buffalo hunter, Frank H. Mayer dealt frequently with U. S. Army officers on the Plains. Mayer recalls that many of them "encouraged the slaughter of buffalo in every possible way," including by providing the hunters *qua* mercenaries with copious supplies of ammunition. One officer explained to Mayer why the army supported the hunt, saying matter-of-factly:

There's no two ways about it, either the buffalo or the Indian must go. Only when the Indian becomes absolutely dependent on us for his every need, will we be able to handle. He's too independent with the buffalo. But if we kill the buffalo we conquer the Indian.²⁰

The slaughter was tragically effective: bereft of buffalo, the nomads starved, spiritually and physically. With their subsistence strategies rendered obsolete, the tribes had to eke out a meager and pitiful existence on government commodities, which were much less dependable than their subsistence strategies. Moreover, because the commodities were distributed exclusively at reservation agencies, the nomads were forced into sedentism. With the buffalo killed off, they had to live by the government agents, around which the reservation boundaries were later delineated. There the former nomads would adopt ranching, and to a lesser degree, agriculture.

The destruction of the herds, on the other hand, was in part less sinister because it was partly unintentional. Like the buffalo hunters, cattle ranchers had

recently started coming to the northern Plains in response to the railroads, driving herds of Texas longhorns farther and farther north, where they were fattened on public domains before being shipped east from the railroad head. Unbeknownst to the ranchers, however, their cattle may have spread such diseases as anthrax or tick fever to buffalo herds. To determine the northern extent of these diseases' range, a federal survey was undertaken in 1883. By 1889, in an attempt to halt the further spread of diseases, federal quarantine restricted the movement of southern cattle to northern ranges.²¹ The spread of the diseases is certain, their effects on buffalo herds is not. Rudolph Koucky believes that one or more of the diseases spread by cattle may have contributed to the destruction of the buffalo herds. From the records of the railroads and buffalo hunters, he found that far more buffalo died around 1883 than were likely killed by buffalo hunters, even accounting for the thousands which were simply slain and never shipped out. Those unaccounted-for buffalo probably died as a result of getting diseases, to which they had no natural immunity, from cattle herds.²² If so, the ecological interactions between livestock and buffalo was more complex than previously assumed; and the ecological ignorance and arrogance involved in introducing exotic species is more egregious than people then (or now, for that matter) were willing to admit.

In the spring of 1882, Otto Maerdian and his cousin went to Montana Territory, lured by reports of free pasturage and easy profits. There they hoped to set up a ranch. Originally from the Illinois, they traveled by train to Miles City, and from there they set out on horseback to explore the Mussellshell Valley as a possible location for their ranch. On the way Maerdian surveyed the land, taking stock of its potential. In a letter to his sister, he wrote that they had "passed over some very nice country and the scenery was grand." Looking out across the short grass plains, he was struck, like so many before him, by what at once appeared to be an immense and empty landscape. As he said, I "can see prairie for five hundred miles. You can look over fifty miles of prairie in some places and not a tree to be seen." Yet Maerdian observed not only the absence of trees, as so many before him had done, but also the presence of other noteworthy ecological features. "I saw lots of prairie dogs," he said, in "some places there are regular villages of them. They dig up the ground and it looks as though it had been plowed." Though prairie dog colonies did severely disrupt the plant

community, especially if their colonies were old, they did not invert the sod (as plowing did), and so the root system and soil structure was kept in place.

Even more interestingly, however, in Maerdian's observations there emerges a picture of a changing landscape, not one unaltered since time immemorial. "Every thing looks green," he said, but quickly cut short any allusions to pristine garden-like conditions by adding that "every here and there [the prairie] is dotted with an old buffalo skull that somebody has killed, and the wolves have made a feast of what was left on it."²³ Considering that most Indians were not in the habit of leaving much meat on the bones of the buffalo they killed, and that by 1882 the buffalo slaughter was well under way, it is likely that what Maerdian was seeing was the remains of that slaughter. Where once there were millions of buffalo, buffalo hunters left heaps of bleaching bones, the next skeleton in whites' ecological closet. Maerdian saw the effects of this slaughter as early as 1882, but little did he and his cattle cohorts know that the bones of their own animals would soon be similarly strewn across the land.

At first glance, cattle might appear to have been an ecological substitute for buffalo, because as large ungulates both would seem to have utilized the same resources and thus played a similar role in grasslands ecology. Yet in addition to spreading exotic diseases, cattle in fact played a much different ecological role, one which only superficially resembled that of the buffalo. Whereas buffalo moved quite often and far in herds, cattle tend to move slower and stay longer in given areas, since they had been for so long domesticated in pens where they moved for short distances and slowly. Compared to trampling buffalo herds, domestic cattle were docile. In fact, T. H. Roberts spent a good deal of time pulling his cattle out of potholes, where, in contrast to running buffalo, cattle would lounge.²⁴ This pattern of grazing stressed grasslands more than had the buffalo.

But the reason why cattle overgrazed was not simply a matter of having too many of them on a given area at one time; the crucial issue was not the density of animals but rather the timing of their disturbances. At any given time, cattle herds probably did not disturb the grasslands any more than had the large herds of buffalo. However, rather than episodically disturbing grasses like the buffalo, cattle disturbed the grasslands constantly, and thus did not give the grass a chance to recover. Had cattle grazed patches more intensively but for shorter periods of time, the land might have been able to support the tremendous

cattle herds. After all, the area had recently supported an estimated three to four million buffalo, a population not unlike that of cattle.

Beyond the differences in their natural grazing behavior, buffalo and cattle had different ecological effects because they were managed for different ends, and these differences resulted not so much from the nature of the beasts as the cultures of the men who managed them. Ranchers owned cattle herds for profit whereas Indians "owned" only the animals they killed for their own use. Cattle were thus managed for profit, not subsistence or reciprocity. Accordingly, ranchers sought to minimize the costs involved in raising them, like corrals, fences, or winter feed, or losses from predators like wolves. In chasing the herds where they roamed freely, Indians never made the buffalo overgraze the grasslands (though in winter the Villagers did probably deplete grass by grazing intensely and by cutting some grasses to store for their horses). In contrast, the cattle ranchers tried to keep their large herds within delimited ranges, lest they be confused with other brands or stolen. In so doing the ranchers forced the cattle to stay longer on a pasture but to trample it less (if at all). Without as much trampling, new seedlings were perhaps less numerous. Such constant grazing pressure gave the grass little or no chance to recover after being first grazed; as a result, the grasslands were stressed.

Cattle were lost to wolves, as Denig had predicted, but only after the mainstay of their diet, buffalo, had been wiped out by buffalo hunters. As a rancher in western North Dakota, Franklin Roberts saw first hand the effect of upsetting the predator-prey relationship between wolves and buffalo. Wolves, he remembered,

never bothered the livestock much until 1883 when the buffalo were gone. In the fall of 1883 there were several herds from Texas brought in and also some shipped in from Minnesota, and within the next few years the country was overrun with cattle. Then the wolves turned to the cattle for their meat.

Unwilling to tolerate (let alone support) wolf populations, ranchers set out to exterminate them. First they poisoned bait which wolves would eat and then die. But as Maerdian learned, the wolves soon learned to avoid tampered bait. In 1882 he reported: "I have not got any wolf hides yet; they are too smart for me. I put some strychnine in to a piece of liver, cut a hole in it, and made it so they could not smell the strychnine, but they won't eat it. They go up to it and smell it

and then walk away."²⁵ After wolves thus "got wise" to the poison, as Roberts put it, ranchers put a bounty on their heads so as to encourage men to hunt them. With this market incentive in place, it took but a few years before almost all the wolves—just like the buffalo before them—had been killed off.²⁶

Beyond the extirpation of another species, the killing of the wolves was tragic in another way: it was a harbinger of how agricultural pests, be they grasshoppers or weeds, would similarly be controlled. Rather than acknowledge that their own activities, be they removing bison or plowing the prairie, were part of the cause of pest problems in the first place, farmers, just as ranchers did with wolves, "blamed" the problem on the pests alone. From this skewed perspective, the logical response was to eliminate the pests, as farmers would also later try valiantly—but never quite successfully—to do with grasshoppers and weeds.

To make matters much worse, cattle ranchers apparently exercised no restraint in the sheer numbers of cattle they grazed, let alone the sophistication with which they managed them. By all accounts, the number of cattle grazed on the northern Plains escalated as ranchers realized how easy it was to convert grass into greenbacks. Boomers boasted that 40-50% profits could be made in one year. As the *Dickinson Press* gloated in 1885, the profits from cattle ranching will soon "dwarf the comparative profits of bonanza wheat farming to small proportions."²⁷ The self-serving projections for growth were as limitless as the grass seemed to be. "There is an abundance of unoccupied land," one cowboy from the Badlands said in 1884, "and an increase in the number of cattle and cattle raisers will work to the advantage of all concerned."²⁸ When it came to ranching on the western Plains, seldom was heard a discouraging word, especially if that word was "overgrazing." By the late 1870s, as many as 500,000 cattle were being grazed between the Black Hills and the Little Missouri Valley.²⁹

However, despite their expectations of a bonanza, there were limits to the amount of grazing pressure that the grasslands could take. In the winter of 1886-87, that limit was exceeded. Contrary to the experience of early whites like Denig, who suggested that livestock could be raised so long as winter feed and cover were provided for them, most ranchers invested in neither, letting their cattle forage for themselves instead. When enough grass grew in summer, and the snow was not too deep, the practice worked. But in 1886-87, the ecological limits to such negligence were made painfully obvious. That year an especially dry summer was followed by a snowy winter, leaving little forage available for

cattle. This natural scarcity of grass was no doubt compounded by overgrazing prior to 1886-87; the resulting coincidence of ecological variation and economic appropriation was tragic. Thousands if not millions of cattle either starved or froze to death. This collapse in turn brought the cattle ranchers to their knees, with many of them quitting the business of large-scale ranching soon thereafter.³⁰ In the span of a decade, cattle went the way of the buffalo.

For all its symbolism and nostalgic appeal, the days of cowboys and dogies were probably numbered from the start. In fact, the same expanding economic system that brought them into existence later made them untenable, as a result of economic costs as well as the ecological collapse just mentioned. The costs of building the railroads that transported buffalo robes and cattle carcasses to market were stupendous, and, at least in the minds of railroad executives, were not offset by the huge grants of land given to them by the federal government. To offset their high fixed costs of construction, then, railroad executives wanted to increase the amount of freight they hauled, and increase it to a greater extent than that which the ranchers could reasonably supply. They rather saw increased freight coming from more agricultural production, which in the 1870s was yet slight. James J. Hill, the founder of the Great Northern Railroad, clearly saw the connection between thick agricultural settlement and his own financial solvency. "You can lay a track through the Garden of Eden," as he said bluntly, "but why bother if the only inhabitants are Adam and Eve."³¹ In order to induce more farmers to take the risks they rightly perceived in farming in Dakota Territory, railroad agents, working with territorial boomers and land speculators, had to somehow revise the perceptions of would-be farmers and investors, who were still encumbered by the outmoded idea the area was something of a Desert.

Rather than being a Desert, boomers enough now proclaimed, the Plains was a veritable garden. It had enough rainfall, they maintained, for dependable and profitable agriculture. But the boomers went even further, claiming that rainfall actually increased as agriculture spread on the Plains. Indeed, "the rain follows the plow," as their slogan went. Writing in the *Dickinson Press*, a Mr. Scott expressed this faith well. In 1883 he happily concluded that "Dakota was once supposed to be a rainless expanse of dry sterile Plains, capable of sustaining only a meagre population of Indians, who lived along the rivers. If such were the facts, there has been a remarkable climate change within the last twenty-five years."³² Yet Scott, along with ill-prepared ranchers, saw his "climate change"

evaporate two years later when drought struck in the summer of 1885, as we have seen. There was a continuum of thought in the Garden-Desert debate throughout the nineteenth century,³³ but through propaganda, personal testament, and pseudo-science, the boomers began revising how Americans generally viewed the Plains. In time they successfully prosecuted what Henry Nash Smith has called their "imaginative conquest of the Desert,"³⁴ for by the late 1800s most Americans no longer thought the region was arid and therefore unarable. Now that the track had been laid, and the Desert defeated, the region was ready to be settled by farmers—and not ranchers.

To the extent that the Desert-Garden debate set the parameters for land use in the Plains, it can be seen less as a meteorological dispute and more as a frankly political determination regarding who would live in the region and how they would make their living there. Those who favored grazing, for whatever reasons, considered the region a desert; those who favored settled agriculture (a constituency which included railroads, boomers, and land speculators) touted the region as a garden. An active and often caustic debate raged between these groups. In local newspapers, advocates of agriculture repudiated the earlier reports from trappers and army officers as thinly-veiled attempts to keep farmers out of the region altogether. In all their haste the boomers took the trappers' sober expectations as intimations that all kinds of farming were impossible.³⁵ Grazing and small-scale farming was seen as an impediment to civilization since it left the land undeveloped and the sod unturned. With this booming chorus the *Dickinson Press* chimed in: "Do cattlemen build churches or school houses or settle the country? No, they prefer to have it unsettled and wild."³⁶ At base the debate was thus about land tenure as much as the weather. For if the region was a desert, collective ownership of pasturage lands would be appropriate; but if it was indeed a garden, exclusive individual rights to relatively small tracts would be appropriate. Insofar as America was firmly committed to private ownership, especially by yeoman farmers, boomers' garden propaganda dovetailed with a societal commitment to extend the profitability of individual land ownership into semi-arid regions.³⁷

What these polemics lacked, of course, was moderation. In classifying the entire region as either a desert or a garden, unvarying across great distances or through time, the advocates of both views obscured the fact that the region is both desert and garden, depending on where and when one is in it. In this respect most Americans still had greatly simplified images of the Plains, ones

which reflected, as John Allen observes, "the geography of hope [rather] than the geography of reality."³⁸ From this perspective the image of the Plains as a garden reinforced the image of the railroad (and the industrialization it represented) as a vehicle for material progress: the one posited that the region had great, even unlimited resources while the other posited that those resources could be converted into capital cheaply and for the benefit of all. Both images were right insofar as the northern Plains did have resources and that they could be used for better or worse.

However, the images obscured the spatial and temporal variability of resource distribution as well as the ecological and social costs involved in procuring them. As a harbinger of industrial society, railroads connoted growth, expansion, material progress; these values, when transplanted to the Plains, were hardly deterred by the limits to agriculture which semi-aridity implied. In 1891 the editor of the *Dickinson Press* explained how railroads made what once was a desert bloom as the Garden. As a boomer the editor sought to deny any hints of aridity, and did so by repudiating General Hazen's conclusion that much of the northern Plains was unfit even for Indians. According to the editor, Hazen had "carelessly dashed it [the region] down as the 'Northwest Desert,' never dreaming that the *iron horse* would disclose a great agricultural realm; richer in all the elements of vegetable and cereal nutrition than any other."³⁹ The editor was astute in the sense that the railroad, as the vanguard of industrialization, combined in large measure the relations of production whereby large-scale settlement and agriculture was made possible on the Plains. In addition, as the boomers appreciated, railroads served as a fulcrum of sorts around which peoples' perceptions of the Plains turned. To the extent railroads both wrought and represented industrialization on the Plains, we might rephrase Marx: there the railroad was the machine that *made* the garden.

¹ Fite, *The Farmers' Frontier, 1865-1900*, pp. 35-39.

² Crawford, *History of North Dakota*, p. 265.

³ *Images of the Plains*, Ed. Blouet and Lawson, p. 193.

⁴ As quoted in Nash, *The American Environment Readings in the History of American Conservation*, p. 8.

⁵ As quoted in Athearn, *Forts on the Upper Missouri*, p. 278.

⁶ Borchert, *America's Northern Heartland*, p. 34.

⁷ Crawford, p. 272.

⁸ As quoted in Drache, *The Challenge of the Prairie*, p. 12.

⁹ Webb, *The Great Plains*, pp. 270-272.

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- 10 Cronon, Nature's Metropolis: Chicago and the Great West.
11 Polanyi, The Great Transformation, p. 71.
12 Steinberg, "An Ecological Perspective on the Origins of Industrialization," pp. 261-276.
13 As quoted in Wilkins and Wilkins, North Dakota: A Bicentennial History, pp. 8-9.
14 Wilkins and Wilkins, p. 52.
15 Briggs, "Early Bonanza Farming in the Red River Valley."
16 Weaver and Flory, "Stability of Climax Prairie and Some Environmental Changes Resulting From Breaking."
17 Ibid.
18 Haines, The Buffalo, pp. 202-204.
19 DeMallie, The Sixth Grandfather, pp. 150-152.
20 Mayer and Roth, The Buffalo Harvest, pp. 29-30.
21 Cole and Mackellar, "Cattle Tick Fever."
22 Koucky, "The Buffalo Disaster of 1882."
23 Maerdian, "Pioneer Ranching in Central Montana: From the Papers of Otto Maerdian, Written in 1882-1883," Ed. Lucia B. Mirrielees.
24 Roberts, pp. 161-163.
25 Maerdian, pp. 15-16.
26 Roberts, pp. 250-264.
27 As quoted in Hummel, "Economic Adaptation and Community Building on the Northern Prairie: A Case Study, Dickinson Dakota Territory, 1882-1891," p. 39.
28 Ibid.
29 Wilkins and Wilkins, p. 52.
30 Paul, The Far West and the Great Plains in Transition, 1859-1900, pp. 202-203.
31 As quoted in Marc Reisner, Cadillac Desert, p. 39.
32 As quoted in Hummel, p. 57.
33 Allen, "The Garden Desert Continuum: Competing Views of the Great Plains in the Nineteenth Century."
34 Henry Nash Smith, Virgin Land: The American West as Symbol and Myth, pp. 201-213.
35 Hummel, pp. 57-58.
36 As quoted in Hummel, p. 38.
37 For an illuminating discussion of related issues, see Ralph Linton, "Land Tenure in Aboriginal America," The Changing Indian, Ed. Oliver LaFarge, pp. 42-54.
38 Allen, p. 217.
39 As quoted in Hummel, p. 113.

Mosaics to Monocrops

In the end Bonanza farming was as transitory as buffalo hunting or cattle ranching. With their high capitalization costs and extensive monocrops, Bonanza farms were extremely vulnerable to economic or ecological fluctuations, or both. For this reason, most failed within a decade or so. Yet their legacy persisted far longer, for as Mary Hargreaves writes, "Bonanza farming development in the Red River Valley had set a pattern for movement into the northern Great Plains."¹ The short-term success of the Bonanza farms was used by promoters to advertise the whole of Dakota Territory as a profitable wheat growing country. Just as the success of trappers' intensive, alluvial gardening was projected across the tallgrass prairies in the Red River Valley, so too was the fleeting success of growing wheat in the tallgrass prairies projected across the western mixedgrass prairies. In these escalating agricultural advertisements, no ecological distinctions were recognized. Boosters blithely assumed that homesteaders could apply humid-adapted agricultural techniques in this unfamiliar, semi-arid environment.

Homesteaders' farming was thus patterned more after Bonanza farms than trapper gardens, though homesteaders would revert to more intensive practices when they had to. Like Bonanza farmers, homestead farmers would have extensive monocrops, dispersed settlements, commercial production, speculation in and exploitation of land, and reliance on technological innovation. Few at the time questioned the extension of agricultural methods and settlement patterns that were adapted to higher rainfall, denser populations, and less variable weather to the Plains, where none of these conditions applied. The extension was simply seen as a natural outgrowth of the expanding nation, the agricultural expression of Manifest Destiny.

One who did question the inexorable westward march of the yeoman farmer was John Wesley Powell, an intrepid explorer and intellectual who, among other careers, headed the US Geological Survey. Unlike most of his contemporaries, Powell recognized the limits that semiaridity imposed on farming, and he also suggested an alternative settlement system which was more adapted to the land. Powell's plan called for the establishment of large "pasturage farms" in which agriculture would be practiced along rivers. On the order of 2560 acres, these farms would have had what Powell considered the minimum amount of land needed to weather semiarid fluctuations. Land

distribution should correspond to watershed boundaries, Powell thought, so that each farm would have access to irrigation water for its limited land in cultivation. "For this reason," he advised, "divisional surveys should conform to the topography, and be so made as to give the greatest number of water fronts." Powell suggested that as few as twenty acres be irrigated. Grazing would take place everywhere else, since fencing would be prohibitively expensive, with "herds roaming in common." Rather than have isolated homesteads, pasturage farms would be inhabited by groups of farmers, so "that the inhabitants of these districts may have the benefits of the local organizations of civilization--as schools, churches, etc., and the benefits of cooperation in the construction of roads, bridges, and other local improvements."²

His ingenuity notwithstanding, Powell was apparently unaware that what he theorized had in fact been long practiced. Indeed, the land-use of the Village Indians and trappers, with their intensive, riverine agriculture and extensive upland grazing, closely resembled that which Powell had in mind for the pasturage farms. Powell intuited what Indians and trappers learned from experience, which was that the Plains was arable as long as farming methods were specifically adapted to conditions there. Like Indians and trappers, Powell was hesitant about extensive agriculture in such an unpredictable and variable region. In addition to publishing his plan in 1878, Powell took his message to the people: in 1889, eleven years after his Report on the Arid Lands was published, he addressed the State of North Dakota's constitutional convention. There he reiterated his prediction that, in contrast to those in the relatively humid, fringe of the Plains, farmers in its truly semiarid regions would suffer recurring droughts and thus economic hardship. "There will be failure of crops," he warned his audience at Bismarck, "and disaster will come on thousands of people, who will become discouraged and will leave." Powell urged North Dakotans "to look the [semiaridity] thing squarely in the face," and he especially chastized the boomer contingent for the way, as he said, you "hug to yourselves the delusion that the climate is changing."³ But in such an exuberant age, any talk of drought, grasshoppers, or failure was summarily discounted as being anti-settlement. As Gilbert Fite concluded, "railroad and land companies, townsite promoters, and all kinds of speculators considered Powell a troublesome ignoramus who had better stick to his books."⁴

Yet Powell's land use plan, unlike Catlin's earlier park proposal, was in no way opposed to westward expansion. In fact, Powell favored expansion, and

apparently had few if any qualms about the industrial economy that was increasingly propelling it.⁵ The differences between Powell and his contemporaries, if not about capitalism, had to do with the yeoman farmer and whether that most cherished unit of society would "stick" to the Plains. Powell thought not. Most others doubted not. But at the time nobody really knew. Even so, boomers and settlers rushed ahead anyway, homesteading the Plains in what was in ways a heedless social and ecological experiment.

With homesteading the family farm became the primary social and economic organization in Plains agriculture. Based on the Jeffersonian model of the yeoman farmer, the family farm was then and still is widely regarded as a wellspring from which all kinds of economic, civic, and spiritual virtues flowed. As farmers yeoman would know nature, which to some of the more devout agrarians was of a piece with knowing God. The spiritual dimension of agriculture gave farming an implicit moral superiority over kinds of occupations, and by implication, gave farmers a moral acuity, acculturated through work and community, which others were thought to lack. Economically, the Jeffersonian model entailed the wide dispersal of landholdings. Dispersed landholdings were seen as a check against the accumulation of land by aristocrats of one sort or another, as well as to check the excessive extension of governmental authority. For this reason agrarians were suspicious of Powell's grazing districts, an economic arrangement which to them seemed more akin to aristocratic ranches than democratic farms. The diffused ownership of land was considered to ensure that the citizenry would be above all independent in an economical and political sense.

To agrarians, economic and political freedom were two sides of the same coin: since they could support themselves, yeomen were expected to be less dependant on and bound by the wishes of others, like bosses or politicians. On an individual level, landowning and farming cultivated such civic virtues as participation in politics and membership in community. Within their local communities, yeomen were expected to be active both informally as good neighbors and formally by being part of social and political organizations. It was taken as an article of faith that farmers who were supported by their communities would in turn support the community. Virtuous, independent, and community-spirited, yeoman farmers formed the base on which the West's agrarian democracy was to rest.

In addition to a commitment to Jeffersonian agrarianism, yeoman homesteading was undergirded by a set of other values and constituencies. Most prominent of these was faith in the right and inevitability of America's westward expansion. If yeoman farmers were seen as carrying the torch of civilization into the wilderness, their way would be lit by the flame of Manifest Destiny. Homesteading was also seen as addressing concerns of a more timely, less trans-historical nature, such as whether slavery would extend into Plains territories and the Indian question, that is, how to deal with Indian tribes in the trans-Missouri West, many of whom had been previously evicted from their homelands in the Mississippi Basin and forced ever farther westward. Homesteading was considered, for various reasons, as a solution to each: Plains settlers would close America's final frontier, forestall the western spread of slavery, and serve as a wedge with which Indians would be pried from their lands.

Above and beyond these rationalizations, however, ~~homesteading fulfilled~~ an even more basic objective on the part of nineteenth-century Americans: the transferal of public resources, like land, to private interests, like farmers. As a philosophy regarding the ideal arrangement between individuals, the state, and nature, this commitment stemmed in part from a heritage of political theory that antedated even Jefferson. This heritage, deriving most directly from John Locke, postulated that the proper role of government should be to dispense the ownership and use of natural resources to the populace at large. Rather than hinder that transfer of resources—or to regulate their subsequent use— (?) government in this view should act to facilitate the private use of resources. In theory such individual use would more or less indirectly benefit society as well: trees would be made into houses; rivers, motive energy; minerals, metals. In this regard Powell's plan confronted another set of underlying assumptions: he in a sense asked Americans to rethink the role of government to be one of manager, and not simply purveyor, of public resources. In spite of Powell, however, America put Locke and his theories to work during the nineteenth century, transferring as fast as possible resources in the public domain to property owned and used by individuals.⁶

Especially after it had bloomed as a garden, the Plains presented an abundance of one such resource: land. Land—all that monstrously huge and mysterious land. Through homesteading the Plains would be transferred from the public domain as grazing land into private holdings as farms. In the rhetoric

of the day, homesteading sought to connect "menless lands with landless men." Of course the slogan, like the society in which it circulated, ignored the reasons why frontier lands were supposedly unpopulated, and why the settlers had themselves been alienated from what land they used to own, wherever that may have been. These avowedly political issues notwithstanding, Americans proceeded to dispense the public domain on the Plains along the socioeconomic lines of family farms.

To facilitate the transfer of land, and to delineate the property boundaries, the land survey system was projected ever further westward. The survey system, which in effect divided the Plains into a rectilinear grid of square miles and 160-acre subdivisions, embodied both Jeffersonian and Lockean precepts regarding land tenure and resource distribution. Based on the Homestead Act of 1862, it allocated 160 acre parcels to individual families, according to Jeffersonian precepts, but did so with little if any cognizance of either topographical or ecological variations, as the swift transfer of land and the minimal intervention of government seemed to demand.

At first glance the survey system, which was based on a two-dimensional view of space, may have seemed best suited to the Plains, where there are fewer topographical variations than in other areas of the country. Yet even if the Plains' flat or undulating landscape was more adequately divided in two dimensions, the system nonetheless excluded another, even more important dimension on the Plains. That dimension was time, and it affected land parcels—be they large or small, fixed or static—in the form highly variable unpredictable rainfall (and weather generally). Unlike in the humid (and hilly) Mississippi Basin, where an adequate amount of rains usually falls every year, on the Plains farmers can have no such certainty, as we have seen. Thus on the Plains two parcels of land, separated only slightly, may be the same in every other respect except that in a given year one receives rain while the other does not. In this way the ecological fact of unpredictable rain was systematically ignored by the way in which Americans homesteaded the Plains.

By refusing to look ~~this semiaridity thing~~ in the face, as Powell had urged them to do, Americans in effect refused to adapt their social and economic institutions to the Plains. American settlement thus proceeded on a different course than had that of the Villagers or nomads. Whereas both the Villagers and nomads made appreciable modifications in response to the ecology of the Plains, Americans transplanted exotic and unsuited institutions there, the result of

which was that white farming would thereafter rest on shaky cultural-ecological foundations.

American institutions reflected the geography of hope, not the geography of the Plains. In wet years, the difference between the two was slight, and so 160 acres might have then supported a family—so long as their subsistence expectations were low. But as soon as rainfall faltered, or the level of hope rose, the difference widened. Not only did both variables fluctuate at the outset, but they also proceeded along a tragic trajectory: the rain decreased occasionally while the hope increased inexorably. For American capitalism would soon be committed to ever-rising levels of consumption, a dynamic which had been articulated over a hundred years earlier by Tabeau as he cogitated about how subsistence-oriented Indians could be lured into fancying ever-more trinkets. In this way Americans' increasing and even limitless economic expectations were at odds with the ecological limits implied by semiaridity.

In 1878, the same year Powell urged otherwise, the homestead boom began. Lured by the bonanza to be had in wheat, and driven by their own hunger for land, settlers by the thousands then started flocking to the northern Plains. The population of Dakota Territory rose from 135,000 in 1880 to 511,000 in 1890; the number of farms likewise rose from 17,000 to 95,000.⁷ Thomas Roberts met this deluge head on. Returning to Minnesota from Sioux Falls, Roberts was accompanied by squawmen guides, who, as he said, could traverse "the prairie without a track." "We met covered wagons going west by the hundreds," he later wrote. "I counted the wagons one day just to see how many we did meet and I counted 77 one day going west to homestead."⁸ Unlike his squawmen guides, these homesteaders and the settlement system they prefigured would leave more than tracks across the prairie, for most of them had come to farm.

Many were recent immigrants from Europe. Having seen advertisements for free and fertile land in Dakota, and facing diminishing access to land or political repression in their own countries, immigrants came to re-establish their lives as peasant farmers. Coming from places like Scandinavia, Russia, and Germany, they brought diverse agricultural heritages as well as a host of their crops, weeds, and pests. Others came not so much to settle on the land as to sell it, however. Many homesteaders, as Gilbert Fite notes, were really small-time land speculators, explaining in part why thirty percent of homestead claims were

commuted and sold.⁹ In any event, only twelve years after the Great Dakota Boom began, one quarter of a million farms had been started in the region and as much as 100,000 square miles of grassland had been plowed up.¹⁰

Homesteaders lived a precarious existence. Exposed to the ecological uncertainties of the Plains, bereft of communities to whom they could at first turn for support, and sorely wanting in capital and technology, they adapted their agricultural practices and economic patterns so as to survive. These adaptations, marked by diverse cultural backgrounds and personal idiosyncrasies, were as varied as the settlers themselves. Despite their diversity, the strategies followed two general patterns, patterns which reflected the settlers' shared socioeconomic contexts. With little capital, tenuous access to markets, and lots of (their own) labor, homesteaders on the one hand developed farming practices and social institutions suited for self-reliance at the local level. As a subsistence strategy, self-reliance sought to maximize the use of locally-available and dependable resources in place of imported and undependable ones. Within individual homesteads self-reliance entailed labor-intensive techniques like gardening, raising livestock, home crafts, etc. Production in these areas was mostly for the family's subsistence, and so alleviated expensive purchases. Between homesteads self-reliance entailed building communities, communities that were included neither in the blueprint of the Homestead Act nor in the rhetoric of rugged individualism. Through working together, homesteaders created innumerable communities across the northern Plains in but a few years time. With lively social and cultural engagement, these communities had more to them than just grain elevators and implement dealers. Rather than simply being outposts of the national economy, Plains communities became hubs of rural culture.

Yet at the same time another pattern was unfolding. This pattern involved not so much local self-reliance as the reliance on markets, capital, and technologies available at the national level only. Export of commercial crops, access to loans, and the purchase of manufactured goods all entailed inter-action with the economy at large. In this way the two patterns implied different orientations on the part of the farmers toward their local communities and the national economy. The patterns were of course not distinct or exclusive. To the extent that no farmers on the Plains were entirely separate from the national economy, and none were entirely separate from their local communities, the contrasting patterns can be seen as lying along a spectrum of sorts. On one end

would lie farms that produced only what they consumed, had little capital and technology, and sought to subsist as they were. Trappers, save for their proclivity to export peltries, can be seen as an instance of this orientation. On the other end would lie export operations that were highly capitalized and sought to grow indefinitely. Of course Bonanza farms are indicative of this pattern.

Yet aside from fur trappers or Bonanza farmers, few farmers embodied either of these patterns so distinctly. Rather, most farms fell somewhere in between, with parts of their operations geared to export crops while other parts were at the same time providing subsistence needs. On the northern Plains, these two patterns of agriculture on the northern Plains were in fact inextricably combined. Almost all farms employed both strategies at different times and in different ways, though, like Bonanza farms, many were heavily dependent on wheat. The two strategies in this way remained at times complementary and at other times contradictory until the early 1900s, when technological innovations in large part replaced labor-intensive aspects of farming.

Before capital increasingly replaced labor, however, Plains farmers pursued a variety of endeavors to increase their own self-reliance, especially upon first establishing their homesteads. In this regard, settlers' ingenuity was as impressive as the obstacles they overcame. To simply get by, as a litany of examples illustrates, they combined their hands with whatever was at hand. Lacking trees for firewood, settlers burned buffalo "chips" or twists of dry tall grasses. To build houses, sod was cut and stacked, for, as one settler put it, sod huts could be "made without mortar, square, plumb, or greenbacks,"¹¹ not to mention lumber. Candles were made from tallow fat and clothes were made by hand. For medicines, settlers used such native plants as slippery elm or sunflowers,¹² and undoubtedly imported exotic species whose uses were long-known to them. Fish were caught from rivers; fowl shot from the air; all in the attempt, as landscape painter Harvey Dunn titled one such scene, to get "Something for Dinner." Cows and chickens were kept, with their milk, butter, and eggs supplying food as well as a crucial increment of cash. And like their farming forebears, settlers gardened.

As a young girl, Willa Cather and her family were some of the many who homesteaded on the Nebraska Plains. There she saw first-hand how immigrants made do with what little they had brought with them and with what nature provided. In O Pioneers, one of her novels set on the Nebraska frontier,

Alexandra is a young girl not unlike Cather herself. From her perspective the effort to provide for and re-establish the family was embodied in her mother.

Alexandra often said that if her mother were cast upon a desert island, she would thank God for her deliverance, make a garden, and find something to preserve. Preserving was almost a mania with Mrs. Bergson. Stout as she was, she roamed the scrubby banks of Norway Creek looking for fox grapes and goose plums, like a wild creature in search of prey. She made a yellow jam of the insipid ground cherries that grew on the prairie, flavoring it with lemon peel; and she made a sticky dark conserve of garden tomatoes. She had experimented even with the rank buffalo-pea, and she could not see a fine cluster of them without shaking her head and murmuring 'what a pity.'¹³

Like Cather's characters, homesteaders across the northern Plains gardened and, when they had to, gathered wild plants to provide their subsistence needs. For instance, Pauline Diede's family immigrated from Russia. As Germans who had earlier immigrated to Russia, but then fled to avoid conscription into the army, the Diedes transplanted their gardening traditions when they settled west of the Knife River Indian Villages. On their way to their claim, Diede remembered seeing the beginnings of agriculture. "It was a rolling country with homesteads perched about, showing patches of turned over prairie soil, indicating that the land was being farmed." Some of this land also was, as she added, being gardened. "Every family had a large garden or two of turned-over prairie soil fertilized with manure. One was a 'bashtaan,' or row garden, of potatoes, watermelons, and pumpkins. The good supply of stored vegetables... in root cellars... made me hope I could provide as well for my family."¹⁴

For many homesteaders, especially women, these gardens were more than a labor of necessity: they were a labor of love. Diede, for instance, had a neighbor woman, known as Mother Boehler, who shared her root cellar and vegetables with Diede's family. "Gardens were her specialty," Diede remembers, "and she would talk out loud to vegetables, encouraging watermelons and pumpkins to grow fast, and she was an expert with herbs, knowing just which ones were mild for children, and which stronger for older people. She felt called on to help others."¹⁵ With their diverse crops, intense labor, lots of care, and even a little verbal fertilizer, these gardens were not unlike those of the Villagers. Indeed, Willa Cather depicts another garden in "My Antonia" that bears striking resemblance to time-tested Indian agriculture. In this scene, another girl like

Cather is in her grandmother's garden, and while leaning back on an Indian pumpkin, describes the scene:

There were some ground-cherry bushes growing along the furrows, full of fruit. I turned back the papery triangular sheaths and ate a few. All about me were giant grasshoppers, twice as big as any I had ever seen, were doing acrobatic feats among the dried vines. The gophers scurried up and down the ploughed ground. There in the sheltered draw-bottom the wind did not blow very hard, but I could hear it singing its humming tune, upon the level, and I could see the tall grasses wave.

In these garden patches, so finely woven into the surrounding ecosystem, the pattern of agriculture was in harmony with the pattern of the prairie, and the feeling of harmony, at least to Cather, was palpable. Lying still as she could, Cather has the girl in the garden feel, in her words, as though

I was something that lay under the sun and felt it, like the pumpkins, and I did not want to be anything more. I was entirely happy. Perhaps we feel like that when we die and become a part of something entire, whether it is sun and air, or goodness and knowledge. At any rate, that is happiness; to be dissolved into something complete and great.¹⁶

Here Cather evokes a profound sense of relatedness to the land. Rather than lacking form or threatening in its wild state, the land was "complete and great." In recognition of its primacy, one found happiness and fulfillment not in controlling it but rather by "dissolving" into it. From this perspective the land was seen as a source of implicit meanings; by merging psychologically and ecologically with those meanings, one attained a state of felicity. Yet the garden was not merely a backdrop, a point of departure for such musings about nature: through it as an the actual place and set of activities one was brought into harmony with the prairie. "Like the pumpkins," Cather's character does not want "to be anything more" but, in the process becomes part of something so much more--the land itself.

Even though most homesteaders gardened for less ethereal and more economic reasons than Cather seems to suggest, their small-scale, intensive practices nonetheless made the prairie bloom. In so doing, the demands made by human economies were in a kind harmony, however fleeting, with the designs of nature. This harmony was also to be found, for instance, in the farm of a man named R. M. Probstfield. As a farmer Probstfield was atypical insofar as he was

wealthy, well-educated, and well-placed (his farm was near the railroad, and so had a ready market). But he was also exceptional as far as farming was concerned, for more than most Probstfield husbanded his land with the utmost in care and acuity. Unlike the wheat monocrops that surrounded him on all sides, his fields were planted to diverse mixtures of crops, including many vegetables. The list of vegetables he grew was as long as his fields were flat. Onions, cabbage, rutabagas, kohlrabi, sunflowers, carrots, radishes, pumpkins, muskmelon, rhubarb, lettuce, sweet corn—all these were but a sampling of his tremendously diverse operation. He had in addition planted rows of raspberries, tobacco, and a grape arbor with seven varieties. His apple orchards had as many as 21 varieties. Nearby was a large natural grove, and more of his own planted to willows, black walnut, and butternut hickory. His care and devotion to the land became something of a family tradition. For instance, by 1882 he had planted a peony plant for each member of his family, thirteen in all. As late as 1969, the thirteen peonies still bloomed at the Probstfield place,¹⁷ kept alive over the years by relatives who, following Probstfield himself, invested themselves in the land.

For a time gardens like these bloomed in the Garden. But unlike Probstfield or Mother Boehler, most settlers who at first had been attracted by the promise of the Garden wanted to finally garden there, an irony that sheds further light on the image of the Plains-as-Garden. As a Garden, the land was a storehouse of seemingly limitless resources from which wealth was to be divested, not, as Probstfield would have it, an operation into which intensive labor was to be invested, let alone, as Cather would have it, an entity into which one happily dissolved. In this respect many settlers, especially in the Red River Valley, shared the goals of Bonanza farmers, namely, to make it quick by growing wheat. In fact, many settlers disdained gardening and other such labor-intensive enterprises, for they sought to be commercial farmers only. As local agricultural historian Hiram Drache observes, settlers on the northern Plains differed from those on previous frontiers in this respect. Rather than scrimp and save as most capital-poor yeomen had previously done, more than a few homesteaders thought that instead of raising cows, chickens, or gardens, they could purchase inputs and foodstuffs, often on credit.¹⁸ Eyeing the profits to be had in prodigious wheat harvests, they rather aped Bonanza farmers—but lacked the capital to even for a short while weather fluctuating rain and prices.

After the humid years of the Bonanza days, many such homesteaders were rudely awakened by the droughts of the late 1800s, including that of the summer of 1885, which, as we have seen, also was a rude awakening to those who tried to reap a Bonanza from cattle ranching. When it came to supporting oneself by farming the northern Plains, wheat monocrops were a thin reed indeed. In response to these uncontrollable variables, many homesteaders diversified their farms,¹⁹ and in so doing heeded the time-tested agricultural adage "not to put all one's eggs in one basket."

In addition to its economic vulnerability, the extension of large-scale monocropping across the northern Plains wrought radical ecological alterations. Perhaps the greatest of these resulted from the new-found way land was divided by the land survey system. As we have seen, the survey delineated land according to fixed and unvarying boundaries, a square mile separated into four, 160 acre sections, all of which was to be regularly used by homesteaders either as pasture or fields. Beyond the perennial issue of whether 160 acres were sufficient to support a family in a semiarid region—a question that has since become moot with the increasing acreages made possible by technical innovations—an even more fundamental implication arises from this method of bounding people and land. That is the fixity of the delineations themselves. The ecological implications of fixed boundaries are apparent in contrast to Indian systems of allocating and using land resources, in which the boundaries of parcels varied in space and time depending on the location and state of resources. For example, if no buffalo herds were nearby, the nomads moved elsewhere; likewise, if the soil moisture were depleted in a field, the Villagers fallowed it. In this way, use of land responded more or less readily to changing ecological conditions, such as a localized drought that made buffalo move to find grass or that dried fields that had been cultivated longer than others. In either instance the boundaries of land tenure and access to resources were flexible enough to allow Indians to alter their practices accordingly.²⁰

This flexibility and responsiveness in land use was to a large degree foreclosed by the fixed boundaries of the land survey. Regardless of the size of the parcels, with fixed acreages farmers had to each year derive a living from their parcels, in spite of their ecological condition. Because individual farmers' fate was linked to specific parcels, they obviously had built-in incentives to reap harvests from them. Droughts might parch them, fires might singe them, and hail might pummel them, but farmers simply had to keep on farming them.

From the perspective of feeding a growing nation (or of filling empty boxcars, as the case may be), this incentive served to increase overall productivity through the circuitous and dispersed route of having individual farmers trying to maximize productivity on their respective farms. But from an ecological perspective, this system of incentives often led farmers, cognizant mainly of their own atomized interests, to exceed ecological limits or otherwise disrupt ecological stability, as we will see.

If the land survey system provided the model for fixed property division, barbed wire provided the material with which this new-found relationship between people, animals, crops, and the land was established. Due to the lack of timber or stones, fencing the Plains only became feasible upon the invention of barbed wire in 1874. With the relatively cheap barbed wire, farmers were able to enclose ever-larger portions of the eastern Plains, restricting the open range ever farther westward. As the bristling edge of agriculture advanced, the cattle trails running south to north were eventually cut off, and ranchers themselves started fencing the open range in a last-ditch effort to forestall the advance of the farming frontier. Water holes, choice pastures, and already-settled agricultural areas were in this way carved up into private holdings. The presence of fences meant on the one hand that cattle and other livestock could no longer move according to the availability of grass and water and shelter. Where buffalo or cattle once roamed freely, they now confronted what were in an ecological sense arbitrary divisions, which, if not placed properly, could easily cut herds off from forage, water, or shelter.²¹ This was undoubtedly a factor in the Blizzard of 1886-87, considering that many cattle starved while pressed against fences on the downwind side of carved-up parcels. On the other hand fencing, in conjunction with other improvements to fixed acreages, entailed certain fixed costs. As suggested earlier, farmers obviously sought to pay for these by the value of crops therein, a winning proposition in wet years but a losing one in dry ones. But farmers, unlike nomads, could not so easily follow the natural distribution of rain or cover wide territories in search of dispersed resources. With fixed titles, and capital sunk in the form of fences, buildings, and wells, they rather had to stay put and farm the land regardless of the weather. In this respect the settlement system and ecological conditions were in tension, with farmers caught in between.

What used to be a shifting mosaic of disturbances and successions—the home to a great variety of plant communities—was about to be reduced to

rectilinear grids of wheat, oats, rye, and barley. The last of the wild prairie would soon be corralled, like so many Indian tribes, into otherwise unproductive tracts of land. But before the great plow-up could begin, the buffalo bones had to be hauled away. Left behind by hunters and diseases, the bones, now bleached by the sun, were strewn so thick in places that they actually obstructed homesteaders' plows.²² But just as technical innovation had earlier turned the buffalo's worthless hides into profitable pelts, with the invention of a new technique of making carbon and fertilizer, there was now a big market for their bones as well. At about six dollars per ton, the bones were not exactly a species of white gold, but homesteaders were nonetheless willing to gather, transport and pile millions of tons of them at waiting railroad cars. Ironically, by using their hides and bones, whites were almost as frugal with buffalo as the Indians had been—but of course destroyed the population with their avaricious appetites. From the Great Plains as a whole, the amount of buffalo bones hauled out could have filled two trains stretching all the way from New York to San Francisco. "Bison bones," as LeRoy Barnett observes, "were really the first crop gathered by many prairie farmers...."²³

In ecological terms, the bones represented the stored resources of the soil and sun, after having been converted from grass by buffalo. Especially rich in phosphorous and calcium, the bones, once transported to factories in the East, were converted to fertilizers and other products. But those minerals never returned to the Plains. In this sense the trainloads of buffalo bones headed east represented an escalation of the ecological exodus from the Plains, one begun by fur trappers and now accelerated by the railroads. As the second major crop to be shipped out, wheat would similarly concentrate nutrients like phosphorous and potassium in its millions of kernels, hardly any of which would ever return to recycle the nutrients. Not that agriculture necessarily involves this degree of nutrient loss; indeed, with the composting of human waste, such nutrients could be replaced in the soil. But since urban consumers were now so attenuated from rural producers, commercial agriculture incurred an incremental though incessant loss of such nutrients. Although Plains farmers often felt they were being given burgeoning loads of excrement from their urban counterparts—what with high freight rates and low commodity prices—none of it arrived in a form that they could compost and spread on their fields.

After 1878, the population boom was mirrored by a boom in wheat production. In 1879, about 265,000 acres were planted to wheat; by 1889, that

amount soared to over four million acres. The increase in other cereals was as dramatic. Barley and oat fields covered about 94,000 acres in 1879; ten years later, with over a million acres to both, they too covered over ten times as much land.²⁴ Of course every acre sown to cereals had to be shorn of sod. In addition to exposing the soil to the weathering and erosion effects mentioned earlier, plowing entailed all but eliminating the biological complexity of the prairie, and replacing it with a handful of species. From this perspective the Great Plow-up was a process of unprecedented ecological disturbance, rivaling even glaciation in its extent and long-term effects. Like glaciation, the plow-up denuded plant communities, ground the sod to dust, and in the long run, displaced tons of topsoil. But unlike glaciation, agriculture did not allow plant succession to resume after the disturbance had passed, for the widespread cultivation of domesticated annual crops like wheat entailed disturbing the land every year. For this reason the Great Plow-up in effect created millions of new disturbance niches. Into these weeds quickly spread. As pioneer species, weeds colonize newly-opened habitats, where they spread their seeds quickly and profusely. Like native pioneering species, weeds thus proliferate in disturbed areas, such as gopher mounds or plowed fields. Yet unlike native species, the weeds that spread in fields faced few ecological restrictions. Given the amount of land recently plowed, and the inexperience on the part of most farmers in dealing with weeds, it is not surprising that during the late 1800s weeds enjoyed a bonanza of their own, as it were.

As a homesteader in the Red River Valley, Charles Hobart found that in some fields the weeds grew as high as the tall grasses they replaced. One field of oats had so many weeds it had been abandoned; while plowing it later in the fall he lost sight of a nearby house because the weeds were so high and dense.²⁵ What made the weeds especially prolific was the fact that many of them had adapted themselves over the course of centuries to fields. Insofar as weeds and crops were annuals, produced copious seed, and thrived in disturbed areas, they were ecologically similar, and so in altering the environment for the production of crops homesteaders were at the same time giving rise to weed outbreaks. Many of these weeds were not native to North America but were rather exotic introductions. Like cattle-borne diseases, they were brought inadvertently, carried in homesteaders' seed, and then planted along with wheat, barley, oats, flax, or rye, their domesticated compatriots. But once on the northern Plains, the weeds were in large measure freed from the insects and diseases that had

formerly preyed on them. With abundant habitat, and few predators, these weeds did doubly well.

The Russian thistle (or tumbleweed) was exemplary in this respect. Having a rounded shape and light weight, tumbleweeds were seemingly made to tumble, which they were. After it reaches maturity, its stem breaks easily, and as it is blown across the flatlands, each one spreads as many as a million seeds. Indeed, tumbleweeds were "made" to spread—but on the Russian steppes, its native range. There German farmers, like the Diederichs' ancestors, had called it "leap the field." Interestingly, in trying to keep it out of their fields, they had planted native American sunflowers as a kind of annual shelterbelt. Since the Spanish had first brought sunflowers back to Europe from the American Southwest, they had been taken eastward across Europe until they were finally grown by Germans in Russia, who used them both to control tumbleweeds and as an oilseed crop.²⁶ The interweaving histories of American sunflowers and Russian tumbleweeds continued back on the northern Plains, where tumbleweed was probably introduced by German Russians in their flaxseed about 1873. For six years it leapt the fields slowly, staying within a three-county area around Scotland, South Dakota. But then it tumbled every which way, spreading all across eastern South Dakota.²⁷

It infested fields so thoroughly that farmers in North Dakota, fearing its unchecked northward advance, convinced the state legislature to construct a wall between the two states (the money was allocated, but for some reason it was not built).²⁸ As early as 1894 all counties east of the Missouri River were infested, and most farmers had fields with at least some of the infamous Russian thistle. In places it was so thick that horses' legs had to be covered with burlap bags; likewise, binders and headers clogged at harvest. So distressed at this one weed's proliferation, farmers in Barnes County, North Dakota, organized what they called the Barnes County Russian Cactus Committee. Among other things, they invited agricultural scientists to advise them on how best to control the weed and adopted a list of practical recommendations, including not plowing any more land and planting sunflowers to check their spread. "Let every farmer try at least half a mile of sunflower," they concluded.²⁹ Like the homesteaders, the Village Indians had long planted sunflowers along the edges of their fields, but did so for an entirely different reason: whereas the Villagers were utilizing the ecological benefits of multiple cropping, homesteaders were trying to compensate for the ecological instabilities of monocropping.

Like weeds, grasshoppers had always been another part of the grass-land ecosystem. When their populations burgeoned, they acted as a kind of airborne herbivore, descending in hordes and snipping the herbage as thoroughly as any buffalo herd could trample it. As a child in Nebraska, Cather had observed these large locusts in the gardens. In such small plots they occasionally devastated crops, a sorry end to more than a few of the Villagers' or trappers' gardens. Their episodic damage to gardens notwithstanding, grasshoppers were in the natural ecosystem under ecological constraints that limited the frequency and extent to which they plagued gardens or the grasslands. Since they lay eggs in bare ground, and are preyed upon by numerous other insects and fungi, their populations were in effect kept in check so long as the amount of bare ground was small and the predators, which live in undisturbed grasslands, were able to find grasshoppers.³⁰ These ecological checks and balances were functioning through the late 1800s, with occasional outbreaks of locusts due to the random coincidence bare ground, lack of predators, and favorable weather. But with the great plow-up, grasshopper habitat, like that of weeds, was greatly expanded. And so, like weeds, grasshopper populations followed suit. As more land was plowed, offering more prime egg-laying habitat, and more monocrops offered ever-more abundant food sources, the frequency and intensity of grasshopper outbreaks increased. Large-scale monocultures had in fact created the best kind of habitat for grasshoppers.³¹

For this reason grasshopper outbreaks were often severe, and posed a great threat to crops. Then the sky would darken with millions of locusts, and sooner or later they would descend, devour whole fields, and devastate the afflicted farmers. In 1874 a newspaper in St. Paul, Minnesota reported one such plague that entered the state from Dakota Territory:

A vast cloud of grasshoppers entered the state of Minnesota July fifteenth, coming from Dakota where the crops were completely destroyed. They crossed the Red River at Moorhead, (Minnesota), where the Northern Pacific bridge is located, moving in a southeasterly direction. The column extended from Moorhead to Mankato, a distance of 225 miles in a straight line, being reported almost simultaneously at all intervening telegraph stations. We can only wait to see what they will do here.³²

Not surprisingly, farmers wanted to avoid such plagues at all costs, and thus went to great lengths to control the pests. However, as in the eradication of wolves or Russian thistles, farmers identified only grasshoppers as the problem,

effectively isolating them from their human-induced causes. In so doing they constrained the range of practices that they could employ to control the grasshoppers. Rather than see outbreaks as a function of excessive amounts of disturbance and food, they were seen as one of nature's unexplainable vagaries. Grasshoppers therefore became the focus of a prolonged and multifaceted eradication effort. In fact, the first official directive to the scientists at North Dakota Agriculture Experiment Station was to find a way to control grasshoppers. As with wolves, grasshopper bait, laced with poison, was spread across fields. When that proved insufficient, farmers resorted to a kind of mobile trap, called the "hopper dozer." This was a sled with a pan of oil which, when dragged across a field, collected and drowned the locusts en masse. Other farmers, including Probstfield, tried smoke as a means of controlling them. However, as he found out in 1876, it was not so easy as that. In July he gasped in exasperation, "Grasshoppers Thick. Grasshoppers by the millions, tried to smoke them out of the garden. It was useless. Vegetables damaged."³³ In the end all such attempts were futile, for the causes of the grasshopper or weed problems persisted after the isolated incident had erupted.

For that reason grasshoppers and weeds still plague farmers on the northern Plains in much the same way as they did 100 years ago. Solving those problems will thus require reforming the pattern of agricultural practices, not simply culling pests' populations with more or less sophisticated technologies. For homesteaders to have addressed such weed or locust outbreaks, they would have had to pattern their practices more after the prairie, as intensive, multiple-cropped gardens had long done. But of course the patterns of monocropped fields and prairie mosaics would for a long time diverge, the results of which was that, in addition to readily-apparent and short term effects like pests, many other ecological costs accrued to the Plains. Among others, these included the mineralization of soil nutrients, erosion, the loss of wetlands, decrease in botanical diversity, and the degradation of rangeland under inept grazing practices. However, the cumulative effects of these trends were only obvious years later, when the Dust Bowl laid bare all the ecological costs that were being incrementally incurred.

Even as homesteaders supplanted grassland communities, they were creating their own social and economic communities. Started at first out of settlers' gnawing need for help, these communities were founded on the

principle of mutual aid. Since almost all homesteaders lacked enough tools, labor, or expertise in all areas, they readily turned to neighbors, sharing or bartering whatever they could with each other. As Diede remembered, "Helping out was a must in those days."³⁴ These were obviously communities of necessity, and therefore involved little in the way of voluntarism or community spirit *per se*. But based on the early pattern of mutual aid and frequent economic integration, settlers later developed communities that went far beyond mere necessity to include rich cultural and social engagement.

Such customary patterns of interaction nurtured cultures in communities, and these communities worked together in a wide variety of activities. The development of communities in eastern Montana was indicative of the region. As Rex Myers argues,

a sense of community or cohesiveness quickly grew where these sodbusters took up residence. They formed groups spontaneously, from the grass roots level up, and their actions demonstrated a putting aside or combining of private desires to achieve mutual benefit.

He characterizes homesteading not as an era of rugged individualism but rather as an era of "togetherness learned from and shared with neighbors. Settlers developed a sense of *gemeinschaft*, manifested first in cooperative acts such as threshing and barn raising, then continued in other activities designed to meet specific felt needs," like schools, churches, post offices, and county seats.³⁵ All these became focal points around which rich community life centered on the northern Plains.

These communities worked and played together. In the spirit of community, occasions for mutual aid were transformed into full-fledged social events, suggesting the degree to which the communities were, at least for a time, economically and socially integrated. Threshing was a prime example of the way Plains communities worked. Motivated initially by the simple necessity to harvest the crops, threshing was embellished with all kinds of social activities, ranging from hearty meals to dancing to gambling. In the late 1800s, distinct cultures developed around the harvesting and threshing of small grains in the Plains. Whether in threshing rings or custom crews, threshing provided a context for manifold engagement, integrating occupational, social, and political dimensions of Plains life into a more-or-less seamless web. In his history of threshing on the Plains, cultural historian Thomas Isern characterizes threshing

as an annual custom in which "men and women engaged in a proud enterprise.... [Threshing] was the focus of a great web of rural culture and institutions."³⁶ Working in groups, threshing entailed extensive engagement between farmers and crew members. While performing any one task, each member had contact with at least two other members, providing ample opportunity for social as well as occupational interaction.³⁷ Rich traditions involving occupational display and outright play developed, serving not only as a way for farmers to express skill at their respective tasks but also as a way to alleviate the monotony of repetitive work. The social and aesthetic dimensions of threshing were taken as seriously as its utilitarian function. In fact, Midwestern threshing crews at times resisted technical innovations that "saved labor" because they did so by decreasing contact between members.

Threshing also engaged farm families in a seasonal round of activities, focusing on threshing itself but spiraling outward to include many aspects of rural life. In the Midwest, farm families organized themselves into threshing rings so as to pool their resources, enabling them to purchase equipment according to the group's needs, coordinate labor sharing, and plan the annual threshing run. Obviously such a degree of integration required extensive and often protracted negotiations between the families involved. For instance, to equalize the varying labor requirements of large and small farms, small farmers traded their labor to large farmers at threshing time in exchange for large farmers' labor over the course of year. Importantly, such labor trading was easily arranged when farms still required a host of chores, like chopping wood, haying, constructing buildings, etc.³⁸ Even in the Plains, where custom threshers and migrant labor were at least as prevalent as Midwestern-style threshing rings, families shared labor and contributed privately-owned resources, such as coal, housing, meals, or equipment, to custom threshers. These "hybrid arrangements," which mixed the patterns of threshing rings and custom threshing, were adaptations of threshing to the Plains, indicating that as a technical process threshing was flexible enough to be responsive to farmers' needs and regional climatic conditions.³⁹

Threshing rings worked *and* played together. The practice of threshing continued after many other tasks on farms had already been mechanized, so threshing provided unusually good opportunity for farm families to socialize. Rings spent the better part of a month or so together, during which time life assumed a satisfactory balance between work and play, exhaustion and

exaltation, intensity and levity. Cooperative and customary working arrangements gave rise to a sense of group identity. In the Midwest, as in the Plains, rich folk life grew out of the customary, multifaceted engagement farm families enjoyed while threshing. When threshing crews were at their farm, women prepared large and sometimes elaborate meals, which to them were a source of both pride and irritation, for feeding the hungry crews involved prodigious labor. The meals were enjoyed by all—men and women, old and young, custom crews and locals. As Rikoon says:

Cooperative ventures affirmed social bonds and perhaps created new ones. Although memories of threshing rings are somewhat romanticized, it is the social experience, rather than the agricultural process, that rural residents emphasize when they talk about threshing as a symbol of a previous way of life.⁴⁰

Beginning in 1913 Clarence A. Larsen worked with the threshing crews that came to his family's farm near Agate, North Dakota. Over sixty years later, Larsen eulogized those long-departed threshing days, providing a concrete if somewhat sentimentalized description of what threshing was like.⁴¹ Larsen recounts a flurry of activity, powered by equal doses of steam and adrenalin, since during harvests anxiety hung as heavy as the ripe heads of grain. Yet through his reminiscences, a mood of festivity also rings clear, for threshing marked the close of the annual season, and the community had once again come together in cooperative work for mutual benefit. Neighbors loaned their horses, threshers, water tanks, and fourteen bundle racks to the Larsens. And the Larsen family in turn hired or traded their own labor for the labor of seventeen men (called "bindlestiffs" and "spikies"), six grain haulers, and one cook.

Working in synchrony from dawn to dusk, each man knew his role and fulfilled it without need of supervision. The work was hard and hot, but the men created their own comical relief. Two men playfully indulged in an "exhibition" boxing match and, after work, men gathered around lanterns and played poker while "Kentucky Kid" strummed his guitar. Upon completing one farm's threshing, Pete said, "Gather round boys," and the men celebrated together over a keg of beer. Over the course of working together, bonds of friendship and comradeship were cemented. Itinerant workers came to identify with particular threshing crews. Apparently bindlestiffs "adopted" their fellows into the fraternity of threshing by giving each other nicknames, for Larsen mentions "Irish

Mike," "Hobo Jake," "Spikie Irish," or "Bootlegger Red," as though they were commonplace, distinctive of a kind of "bindlestiff subculture." Undoubtedly Larsen, who was a young boy at the time, glorifies what was obviously exhausting and dangerous work, but the underlying pattern of a farming community sharing in both occupation and celebration is incontrovertible.

But there were from the start signs of strain in the fabrics of these communities. Of these, individualism and rising standards of living, to be delivered by technical innovation, were two of the most important. Even though the image of rugged individualism did not account for all of homesteaders' motivations, it nonetheless played an important part in their value systems and social relations. Homesteads were essentially atomized socioeconomic units--despite the fact that in many ways they had to integrate with other homesteads--and this basic atomization conditioned the degree to which they could form cohesive, lasting communities. Though they found cooperation helpful and indeed enjoyable, and their cultural traditions often emphasized ethnic solidarity or community involvement, homesteaders were economically isolated. Their interests were therefore oriented not so much toward group well-being as their own isolated selves. Despite the artifice of community building, this bifurcation between individual and collective interests pulled Plains farmers in competing directions.

Homesteaders did not address the conflict in these terms, of course, but it is nonetheless apparent in their descriptions of their own lives. For instance, in her auto-biographical novel Grass of the Earth, Aagot Raaen remembers a conversation she had with her sister, Kjersti, in which the issue of community vs. individual interests arose. Homesteading near the Goose River, the Raaen family had built their own sod house and were eventually joined by other homesteaders. As children, Aagot and Kjersti re-enacted their own lives in play, first laboriously building their own house. After completing it, Aagot said,

"We must build another house." "Another house!" Kjersti repeated. "We have all we need!" [To which Aagot replied] "We must have neighbors, and neighbors mean houses." Kjersti had many conversations with herself as she trudged and worked: "Why must we have neighbors? [she asked,] They will cause trouble. Why so much extra work when we have our own house to keep?"⁴²

In this conversation can be heard a larger, societal dialogue concerning the importance of community, the hard work of maintaining it, and the tendency of pioneers and later farmers to fall back on their own resources. Even though homesteaders did indeed go to the trouble of "building houses" and other acts of mutual aid with neighbors, a sentiment here voiced by Aagot, they at the same time harbored ambivalence about doing so, reservations which Kjersti mulled over. With increasing mechanization in the early 1900s the ambivalence would, in effect, be finally resolved in favor of Kjersti's individualistic orientation. For as machines replaced more and more aspects of farm work, there were fewer and fewer activities that needed the kind of cooperative work Aagot supported. Indeed, with mechanization there would be less and less farm work in general, which was precisely farmers' motivation for buying machines in the first place.

Through technical innovations settlers sought relief from drudgery, and perhaps, sometime in the future, the related rise in their standards of living. Considering that much of their agricultural work was repetitive, labor intensive, and [arguably] poorly paid, it is not at all surprising that many farmers looked to machines to relieve them of their burdens. Technology was, from their perspective, a liberation from the kind of work that industrialized America had come to increasingly consider as ceaseless toil. With machines, farmers could increase their productivity, decrease their labors, and enjoy new-fangled implements to boot. In this way the nature of agricultural labor was undergoing a slow but inexorable revision in industrializing hinterland. Where before agricultural tasks were accepted as being unavoidable, now they could be replaced by technical innovations. Raaen again provides a paradigmatic example of the way farmers' rising expectations drove their acceptance of technical innovations. For many Dakota farmers, the liberatory promise of technology was embodied in the travelling implement dealer. As a purveyor of new-fangled implements, these traveling salesmen tried to convince farmers that the goods they offered were worth going into debt for, not unlike the fur trappers of yore. As Raaen remembers the scene, salesmen would come to town and say things like:

"You farmers work too hard and suffer too much. I have seen enough to know that if you keep on this way you will be old long before your time. Yes, and you will be crippled. What we have here will save you from all this." He pointed to the grand display. "Let the machine work for you." The pioneers had often suffered and worked beyond their strength, but

they had accepted hardships as part of the payment for owning a home and a quarter of land.... They had become so used to getting along with little that they had grown contented with simple living. Now the hard-won contentment began to change to discontent.

This discontent with simple living was from the start probably more common among Dakota farmers than Raaen suggests, especially among those who tried to farm commercially. But most farmers simply wanted to not have to work so hard; capitalizing their operations seemed to be the only way of doing so. Capitalizing farms, however, had costs of its own, of which farmers paid the lion's share through borrowing. As Raaen finishes the scene:

A farmer who was easily persuaded, spoke up: "We need the machine. We want the machine. But we haven't the money to pay for it." "Oh, money!" the agent shouted. "That's nothing. All you do is sign a paper and pay so much every fall when you market the grain. These prairies that stretch beyond the horizon hold an endless amount of wealth. Gold mines can be drained of their wealth, but these prairies never can. Break up the soil! Seed it in wheat, and your fortune is made."⁴³

What the salesman did not mention, of course, was the burden of paying back the loans. Especially when it didn't rain, or the crops failed for some other reason, mounting debt was an extra and often excessive strain on farmers. The Raaens, for instance, referred to their mortgage as "The Burden," for it was an overarching and unceasing struggle to pay it off. Though perhaps the most poignant, debt was one of the many ways Plains farmers had become dependent on urban centers. Transportation, markets, and technological development were similarly necessary for their farming--but beyond their control. In time these ties of dependency would in large part unravel the fabric of their communities, renting apart the pattern of social and economic integration Plains people once enjoyed.

¹ Hargreaves, Dry Farming on the Northern Plains, pp. 38-39.

² Powell, Report on the Lands of the Arid Region of the United States.

³ Sperry, "John Wesley Powell's Address at the North Dakota Constitutional Convention."

⁴ Fite, The Farmers' Frontier, 1865-1900, p. 95.

⁵ See Donald Worster, The Dust Bowl, (New York: Oxford, 1982), pp. 85-87.

⁶ Hurst, Law and the Conditions of Freedom.

⁷ Fite, p. 94.

⁸ Roberts, "Pioneer Life in Western North Dakota," p. 137.

⁹ Fite, p. 100.

¹⁰ Borchert, America's Northern Heartland, p. 44.

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- 11 As quoted in Fite, p. 44.
- 12 Kammen, "Herbal Treatments Using Plants Found on the Northern Plains: Pioneer Remedies and Folk Medicines."
- 13 Cather, "O Pioneers," Cather: Early Novels and Stories, p. 152.
- 14 Diede, Homesteading the Knife River Prairies, pp. 21-23.
- 15 Ibid., p. 63.
- 16 Cather, "My Antonia," Cather: Early Novels and Stories, p. 724.
- 17 For a description of Probstfield's farm, see Hiram Drache, The Challenge of the Prairie, Fargo, ND: North Dakota State University Institute for Regional Studies, 1970, pp. 101-103.
- 18 Drache, p. 118.
- 19 Hummel, "Economic Adaptation and Community Building on the Northern Prairie: A Case Study, Dickinson Dakota Territory 1882-1892," p. 114.
- 20 For a good discussion of the ecological implications of land allocation systems, see William Cronon, Changes in the Land, pp. 54-81.
- 21 Hayter, "Barbed Wire Fencing--A Prairie Invention."
- 22 Drache, p. 59.
- 23 LeRoy Barnett, "The Buffalo Bone Commerce on the Northern Plains."
- 24 10th and 11th United States Census, 1880 and 1890.
- 25 Hobart, "Pioneering in North Dakota."
- 26 Putt, "History and Present World Status," pp. 1-29.
- 27 Dewey, "The Russian Thistle: Its History as a Weed in the U. S., with an Account of the Means Available for its Eradication."
- 28 Walster, "North Dakota's War on Russian Thistle."
- 29 See "Barnes County Russian Cactus Committee Scrapbook," on file at the North Dakota Historical Society Collections, Bismarck, ND, File Number A331.
- 30 Dempster, "The Population Dynamics of Grasshoppers and Locusts."
- 31 Ibid.; Munro, "Grasshopper Outbreaks in North Dakota, 1808-1948."
- 32 As quoted in Briggs, "Grasshopper Plagues and Early Dakota Agriculture, 1864-1876."
- 33 As quoted in Drache, The Challenge of the Prairie, p. 167.
- 34 Diede, p. 55.
- 35 Myers, "Homestead on the Range: The Emergence of Communities in Eastern Montana, 1900-1925," pp. 218-227.
- 36 Isern, Bullthreshers and Bindlestiffs: Harvesting and Threshing on the North American Plains.
- 37 Rikoon, Threshing in the Midwest, 1820-1940: A Study of Traditional Culture and Technological Change.
- 38 As farms were increasingly mechanized it became difficult for farmers to maintain labor exchanges and consequently threshing rings began to fall apart (Rikoon, Threshing in the Midwest).
- 39 Isern.
- 40 Rikoon.
- 41 Larsen, The Threshers are Coming! Memories of Steam Threshing Days and Other Poems.
- 42 Raaen, Grass of the Earth: Immigrant Life in the Dakota Territory, p. 47.
- 43 Ibid., pp. 99-100.

Agricultural Assimilation

By the end of the 1800s Americans were uncertain how the federal government should deal with Indians and their reservation lands. With mounting pressure from white homesteaders to open reservations to settlement, and increasing reports of squalor and starvation on reservations, it was clear that something needed to be done to resolve "the Indian question." So-called "Friends of the Indians" proposed the Dawes Act, a piece of federal legislation that attempted to solve a number of problems at once. First, they sought to save a modicum of land for Indians. In their estimation white encroachment on the reservations was not only inevitable but imminent, so they thought that allocating specific tracts of land to individuals would bolster Indian claims to those select parcels. Even if not all the reservation land was thus protected--which they indeed knew it would not be--at least some of the land would remain under Indian control. Under the Dawes Act, Indians could not sell their titles for six years after allotment, or until an agent judged them competent. However, it was understood that the reservation land that was not allotted to Indians--and much of that which was allotted to them, after six short years had passed or agents deemed them competent--was to be transferred to whites. In this way the Dawes Act placated homesteaders and their Congressional representations, who wanted reservation land thrown open to settlement.

In addition to forestalling the alienation of all Indian land, and to some degree, opening reservations to settlement, proponents of the Dawes Act had avowedly cultural aims. Even to self-proclaimed "Friends of the Indian," the overarching goal of Indian policy was seen as speeding Indians along the linear path of progress from their "traditional" barbarism to white "civilization." Insofar as whites saw yeoman farmers as the bearers of civilization, for reasons described earlier, proponents thought that if Indians could be re-made into yeomen, they themselves would eventually embody all its virtues, economical and moral. What making Indians into yeomen meant most fundamentally was revising their notions of property and reciprocity. If Indians were to be assimilated into white culture--which is exactly what "Friends of the Indians" intended--they had to slough off the last vestiges of tribal lifeways, especially the social cohesion with which they had been so familiar. To become full-fledged members of white society, proponents of the Dawes Act thought, Indians would have to think and act more for themselves as individuals. Community life in tribes was now

obsolete, proponents of the Dawes Act assumed, and so the socioeconomic institutions that undergirded it needed to be replaced with those of white society.

The Dawes Act wrought this change by linking individuals' economic interests as much as possible to their own labor and property. No longer would individuals' generosity and standing in the larger community--the traditional basis of support--serve as the principle of economic activity.

Private property was seen as reinforcing individual initiative: if one could keep all that which he or she produced, they would have incentive to work harder. To the extent Indians were seen as not having private property, it was assumed that had no incentive to work. This view was enunciated as early as 1816 by William H. Crawford, who as Secretary of War administered Indian affairs. Crawford defended the policy of trading with Indians, even though it lost money annually, because as he said, it "cannot fail to introduce among them distinct notions of private property. These ideas," he asserted, "must necessarily precede any considerable advancement in the arts of civilization, and presuppose the institution of laws to secure the owner in the enjoyment of his individual property." Crawford concluded by articulating what would be the implicit basis of the Dawes Act: "No man," he said, "will exert himself to procure the comforts of life unless his right to enjoy them is exclusive."¹ The same principle, according to both Crawford and proponents of the Dawes Act, applied to land. As Leonard Carlson has written, Indian reformers had "an almost mystical view of the power of allotment to transform Indians into hardworking individuals."² What such white appraisals misunderstood, of course, was the fact that Indians did have private property and incentives to work, as we have seen. The difference was that in Indian economies both property and work were oriented more toward collective good than individual accumulation. That would change under the Dawes Act, however.

As the Act's sponsor, Henry Dawes was explicit about its intentions. Speaking of the Five Civilized Tribes, whose land tenure was not too dissimilar from the Villagers', he said bluntly,

They have got as far as they can go, because they own their land in common. It is Henry George's System, and under that there is no enterprise to make your home any better than your neighbors. There is no selfishness, which is at the bottom of civilization. Till this people will consent to give up their lands, and divide them among their citizens so

that each can own the land he cultivates, they will not make much progress.³

As the engine of progress, selfishness was not a problematic aspect of human nature, but rather one of civilization's defining virtues. To people who had formerly considered generosity and reciprocity as the basis of relationships, this was indeed a profound shift. It represented the attempt to sever Indians from their patterns of traditional social relations and increasingly insinuate them into the values of capitalism. As General Thomas J. Morgan, commissioner of Indian Affairs, explained in 1892, the Dawes Act tried to make Indians into what he called "independent citizens." Rather than rely on extended kin relations, these "independent citizens" would be

dependent alone upon their own exertions and subject to the ordinary laws and processes of civilization. The change is a momentous one, and involves a reconstruction in many cases of all their fundamental conceptions of life and a radical change in their relations.⁴

Insofar as the Dawes Act tried to detach Indian economics from its socio-cultural roots, it can be considered as analogous to what Polanyi described as the Great Transformation. Although the Dawes Act did not establish industrial relations *per se*, it attempted to recast the pattern of Indian social and economic relations, from one of community and kinship to one of individuals and competition. Edward Goodbird was Buffalo Bird Woman's son, and he identified with Hidatsa traditions. As an assistant to the reservation agent, who was trying to get the Villagers to form their newfound allotments, Goodbird saw how traditional concepts of reciprocity did not correspond to white notions of property and its individualistic use. In the following example, Goodbird describes in detail how reciprocity still conditioned economic exchange between the Villagers.

I kept a pig last year and fed it a good deal of corn and worked hard so as to keep it, but when I killed it in the fall, the pig's meat lasted me and my family only four days. We Indians have a custom that when we kill an animal we send a present to our friends. When I slaughter a steer, I send ten pounds to Wolf Chief and ten pounds to each of the other families of my friends in Independence. In this way the steer is gone to my friends, but when my friends kill a steer they do likewise, and always remember me.⁵

So long as the community maintained reciprocal relations, each individual had an incentive to work, whether in raising cattle or feeding pigs, because they knew their efforts would someday be duly reciprocated. Into the 1900s the Villagers expected to reciprocate each others' gifts and to follow kinship obligations. Gilbert Wilson noted the following exception to the pattern, for instance, which just as certainly indicates the degree to which people acted according to reciprocity. After Front Woman had made a fancy robe, she hid it when Water Chief came inside, lest she feel obligated to give the robe to Water Chief, who would then feel obligated to give Front Woman a horse in return.⁶ It was precisely these substantive, cultural values which the Dawes Act sought to subvert, "freeing" Indians in the process from that web of social obligations which whites saw as hampering their moral and material progress.

The actual allotment of reservations began in the late 1880s. The first reservations to be allotted were on the eastern Plains; those on the western Plains were allotted later as pressure from homesteaders and their Congressmen intensified. Reservations were allotted in large part to transfer land to whites. When Rosebud Reservation was allotted in 1898, for instance, all the less arable land was allotted to Indians first, and then the remaining and profitable land was settled by whites. Homesteaders hungered for this land. Over 200,000 of them registered for less than 6,500 claim sites on the Rosebud Reservation.⁷ After allotment, much Indian land was in this way lost to white homesteaders. The alienation of Indian land accelerated even further as Indians were judged competent to lease their parcels to whites. A growing number of Indians then started to view their land as a mere commodity, and the white ranchers and farmers who leased Indian land started to think that they owned it.⁸

Once Indians' land was allotted to them, they were expected to settle it as their white counterparts were doing—with isolated homesteads inhabited by one family each. As families spread out across the land, the cohesive communities they formerly enjoyed started to slowly atrophy. For both the Villagers and the nomads, living in dispersed allotments broke apart family ties and socioeconomic integration. As Norma Seerley observes, "by attaching a nuclear family to a parcel of land, the bonds within the traditional *tiyospaye* were weakened. While some [who were] related were able to obtain land allotments in contiguous areas, the traditional camp life and family groups became a thing of the past."⁹ For the Villagers, allotments fundamentally altered the relationship between their society and the land: where for hundreds of years they had lived together as an

integrated society with matrilineal residences, after the Dawes Act they lived more as isolated families with patrilineal residences.¹⁰

By dismembering Indian communities, the Dawes Act and its attendant socioeconomic values ruptured the cohesive moral fabrics in which reciprocity could function. After families spread apart, and tried to be as independent as possible, fewer individuals maintained reciprocity. Buffalo Bird Woman explained how these changes altered economic relations between Villagers. "In old days we did not barter as we do now. We went to the next lodge, of relatives or neighbors, if needing food. Any kind of food needed was given or asked without thought of pay."¹¹ Goodbird also noted how changing property relations and settlement patterns altered. Once these socioeconomic changes were underway, he intimated it became decreasingly practical for people to invest time and money in gifts that would go unreciprocated, such as pigs. He said, "This custom of ours [giving away meat] makes it so that it does not pay to keep pigs or do a great deal that white men want us to do. It is hard for us to break our Indian customs. I would keep pigs but what is the use of raising pigs when our custom makes us give away the meat."¹² Presumably keeping pigs would have "paid" if others would have similarly given away some of their meat. But the "grand policy of selfishness," as Allan Harper calls the Dawes Act, was effective in this regard, for as Indians increasingly sought to look after their own interests, the interests of the community seemed that much less compelling.¹³

Under the Dawes Act, Indians on the various reservations farmed differently, depending on their cultural background, location, and the skill and energy of their agents. The nomads, having little or no agricultural heritage, did not take to farming quickly. They were also hampered by the agents' own lack of experience farming the Plains. And their machinery was often limited and in poor repair. For these reasons most of the nomads farmed incidentally if at all, raising mostly garden vegetables and only a little cereals. Instead of agriculture, cattle ranching was more successful among the nomads, though they were still overwhelmingly dependent on the government.¹⁴ The Villagers did better with extensive cultivation, but similarly confronted the limits of dry climate and their agents' lack of experience. As an assistant to the agent, Goodbird helped lay out fields, most of which were about ten acres, and supervised their plowing. In these fields the agents directed Villagers to plant such crops as wheat, oats, etc. Like their white neighbors, the Villagers faced many obstacles like drought, frosts, and hot winds. Consequently, the Villagers did as poorly with their

extensive monocrops as their white neighbors. After suffering repeated crop failures, the agent at Fort Berthold recommended that the Indians cultivate only corn, potatoes, and garden vegetables--just as the Villagers had long done. Buffalo Bird Woman had in fact never stopped doing so. As an expression of their cultural pride, and as a demonstration of their agricultural expertise, she and a few other Village women kept on gardening in the river valley. In comparison to her Hidatsa gardening ways, she was not impressed with the white agricultural methods that were being imposed on the Villagers. As she said,

The government also came here and broke up prairie ground and had us plant corn in it, but these fields on the prairie up near the hills get dry very quickly and the ground is hard and difficult to work. I don't think that the new way is so good as the old way of keeping our gardens down in the timber.¹⁵

Had reservation agents and white society listened to Buffalo Bird Woman, and in some way implemented her time-tested techniques, the final and tragic extension of extensive cultivation into the western Plains might have been avoided. But America was still no more ready to listen to women gardeners than it had been ready to listen to men like John Wesley Powell.

Not everyone concurs that the Dawes Act was such a miserable failure, however. Despite the degree to which it alienated Indian land holdings and dismembered their communities, it did increase agricultural productivity and the income Indians derived from it. For these reasons Burt Powell argued that the Dawes Act was "a qualified success." Instead of alienation and loss of community, the problems with the Dawes Act was that it discouraged efficient land use, since the original allotments were too small to take advantage of technical innovation. Rearranging land holdings, for large-scale ranching or farming, which Powell assumed was more efficient, entailed high transaction costs because to do so, individual Indians had to wade through a daunting amount of bureaucracy. Further, the attenuated property rights, whereby Indians could use but not sell their land, made the system of land tenure even more inefficient. In Powell's view the Dawes Act "prevented low cost creation of efficient ownership and operations units."¹⁶

Though its transaction costs were indeed high, and perhaps did discourage Indian landuse, the Dawes Act failed not because it lacked efficiency

but because it destroyed Indian communities and let their land base slip away. However, from the perspective of economics, articulated here by Powell, both community and land are externalities; they are directly affected by individuals' economic activities, but neither are included in individuals' economic calculations. They are therefore not reflected in measures of productivity or profit, and can thus deteriorate even as measures of economic activity seemingly improve. For this reason Powell, like other economists, did not account for the "costs" that the Dawes Act exacted on Indian communities or culture. After the Dawes Act, as Thomas Wessell concludes, "The Indians of the northern Plains were soon left without a farming economy, without cattle, without much of their land, and for many, without hope."¹⁷

¹ Report of William H. Crawford, Secretary of War, to Senate, 14 March 1816 Indian Affairs II, as quoted in Crawford, p. 563.

² Carlson, Indians, Bureaucrats, and Land: The Dawes Act and the Decline of Indian Farming.

³ As quoted in Carlson, *ibid*.

⁴ As quoted in Carlson, *ibid*, p. 34.

⁵ As quoted by Wilson, 1913, p. 154.

⁶ Wilson, unpublished field notes, 1916, p. 182.

⁷ Carlson, p. 68.

⁸ Hurt, Indian Agriculture in America, p. 143.

⁹ Seerley, "A Social System Analysis of the Changing Food Practices of the Teton Dakota Indians, 1800-1900," p. 55.

¹⁰ Jeffrey Hanson, "The Hidatsa Natural Environment," in The Way to Independence, Carolyn Gilman and Mary Jane Schneider.

¹¹ Wilson, unpublished field notes, 1916, p. 224.

¹² Wilson, unpublished notes, 1913, p. 154.

¹³ Harper, "Salvaging the Wreckage of Indian Allotment," in LaFarge, p. 86.

¹⁴ Hurt, p. 148.

¹⁵ As quoted in Gilman and Schneider, p. 201.

¹⁶ Burt Powell, "Land Tenure on Northern Plains Indian Reservations."

¹⁷ Wessell, "Agents of Acculturation: Farming on the Northern Plains Reservations, 1880-1910."

Deserting the Garden

In 1898, twenty years after the start of the Great Dakota Boom, a second homestead boom began. Since prices for agricultural commodities were high at the end of the 1880s, and the frontier was finally closing up, settlers once again rushed to claim land. But this time there were two key differences. First, they claimed land in the western portions of North and South Dakota or eastern Montana, where rainfall was even lower and less predictable than in the mixedgrass prairies. And secondly, an even larger proportion of land speculators tried to get in on the second boom, and there were more homesteaders who had no farming experience--let alone experience farming under such difficult circumstances. For this reason, even though prices were rising and yields burgeoning, not all homesteaders partook in what appeared to be a kind of latter day, shortgrass bonanza. Many of those who had simply come as land speculators soon commuted their claims, sold them, and left. And those who had the perseverance to stay faced tough odds.

Many of these homesteaders adopted the same strategies as had the first generation of settlers: they tried to minimize their expenditures while maximizing their own self-sufficiency. The Doll Family, who in 1912 homesteaded near Fort Benton, Montana, exemplified this persistent pattern, adapting as an individual families to the ecological and economic conditions they faced. Like the Diedes or Mother Boehler, they tried to diversify their farm and utilize as many locally available resources as possible. They raised pigs, cows, turkeys, chickens, cut ice from the river and stored it in their icehouse, gathered wild fruit to preserve, etc. And they too gardened. Being far west, they were particularly vulnerable to drought, and so they developed ingenious gardening techniques. For instance, they buried tin cans, through which holes had been poked, next to individual plants. When water was poured into a can, it was slowly absorbed by the soil, so that little was lost to runoff or evaporation. In addition to an assortment of European vegetables, they also grew flint corns and Indian sunflowers.¹ These subsistence enterprises served an essential role in the droughty Plains: they enabled homesteaders to survive hard times. As Billie Arnott remembers of her mother, who also homesteaded near Fort Benton, Montana,

Whenever the garden produced abundantly, the women of the household labored long into the night to preserve every bit that was grown.... The land was so often flagged with droughts and to have a cellar full of canned vegetables was a comfort, not a work of hardship.²

Of course Arnott's memories are sentimentalized in that her mother's labors, unremitting and largely unrewarding, were indeed a hardship. Like most home-steaders in the shortgrass Plains, the Arnotts faced routine obstacles; besides the weather and at times low crop, these included high interest and freight charges. These were an especially poignant source of resentment, since there were more than isolated instances of railroad fraud and the freight rates they charged hinterland customers seemed abnormally high. As President of the Northern Pacific Railroad, James J. Hill was identified by farmers as a leading conspirator in their demise. A popular Montana farm ditty suggested how enraged they had become at "outside interests" like Hill:

Twixt Hill and Hell
is only one letter;
if Hill was in Hell
we'd feel much better.³

No longer did farmers see railroads as the purveyor of progress. Now farmers rather saw them as a symbol of an unjust economic system, one in which power rested in centralized corporations outsided the region. Farmers were also resentful of their dependance on these centralized interests, for many had at first settled there after being attracted by the railroads' advertisements, which suggested that with proper farming techniques--not to be confused 'dry farming' methods, which they felt wrongly implied aridity--the area as being easily and dependably arable. When coupled with the larger homesteads authorized by Congress in the Enlarged Homestead Act in 1909 (which doubled the size of claims from 180 to 360 acres), dry farming techniques--whether referred to by name or not-- were touted by developers and railroads as an adaptation of agricultural practices to the shortgrass Plains such that farming without irrigation would be dependable there.

Dry farming techniques, despite the promotionalism surrounding them, were not really that new by the late 1800s. As Mary Hargreaves documents in her Dry Farming on the Northern Plains, the collection of techniques associated with dry farming revolved around the common principle of maximizing dry,

low-yield acreage so that even if yields were low, overall income would be moderate. The specific practices involved in dry land farming included extensive cultivation of large landholdings, specialization in a few export crops, and summer fallowing. White farmers had observed as early as 1885 that if a field was tilled but not planted all summer long, a period in which rain collected in the soil, its yields the next season could be dramatically improved. This practice had in a sense been long employed by the Villagers, who fallowed their fields for perhaps as many as three or four seasons. However, even as they applied the same ecological principle, white farmers altered its actual effects because they fallowed upland fields, where soils were far more exposed to wind and rain erosion, and because they fallowed larger fields, which are more vulnerable to both kinds of erosion.

Summer fallowing had at least three kinds of ecological impacts, one of which was not evident until decades later. That impact was soil salinization, as mentioned earlier, and it was caused by the removal of plants which had acted in the prairie to moderate the movement of water through the soil. But with denuded soil surfaces, more rainwater percolated down faster, accumulating mineral salts as it descended. Eventually this salty water reaches an impermeable layer like coal or shale, at which point it flows horizontally. Wherever such layers near the soil surface, salty waters seep out, and effectively salinize the soil. As a result of the widespread practice of summer fallowing, started around the turn of the century, millions of acres across the northern Plains have been salinized, which means they have been taken out of production of most crops. In addition to salinization, summer fallowing invites water and wind erosion. Whenever heavy, intense rains fall, much of the water is not absorbed in the bare ground, and runs off. In so doing it loosens soil particles, carrying them away, and in long, steep fields it gouges out gullies. But from the start of the second homestead boom until the tragic 1930s, soil "blowing", as farmers referred to wind-borne erosion, was by far the most dramatic sign of plowing's ecological effects.

Summer fallowing and extensive cultivation had been previously employed by Plains farmers. What was really new about the dry farming movement, as Mary Hargreaves points out, was the intense propaganda campaign its promoters waged. Like the boomers who had called the region a Garden, the promoters of dry farming sought to attract more and more settlers to the ever-expanding frontier. These promoters, not surprisingly, often had

financial interests in this settlement. Many of its more outspoken advocates came from the boomers' ranks--railroad owners, bank executives, land speculators, or state developers. And like the Garden's boomers, dry farming's promoters recognized no limits to their practices: they didn't stop advertising that land on the frontier was available and arable until the frontier was no more. With high war-time prices, this promotionalism fueled a second plow-up, the pace and extent of which was great. Between 1908 and 1919, an average of about 500,000 acres were plowed up every year in North Dakota. Likewise, between 1910 and 1920 over one and a half million acres were plowed up in South Dakota.⁴ Even land that was not plowed felt the effects of this productivity boom, for the grazing pressure on native shortgrass pastures similarly surged: between 1900 and 1919, the number of cattle climbed from 38 to 113 million in eastern Montana, 11 to 60 million in Western North Dakota, and from 17 to 68 million in western South Dakota.⁵

By all measures, most farmers' agricultural practices were still ecologically unstable, especially their continued practice of widespread monocultures. Just as grasshoppers outbreaks in the 1880s indicated ecological instability of monocrops, so too were the outbreaks in the first three decades of the 1900s that indicated the instability of large monocrops.⁶ Another indication of the instability of monocrops was the proliferation of blackstem rust, a fungus that infects cereal crops generally. In order to complete its life cycle, blackstem rust must be in proximity to the common barberry bush, on which it forms its spores. To their dismay, many farmers had planted barberry (an exotic shrub from Europe) in and around their farmsteads, and so were inadvertently facilitating the spread of blackstem rust. But instead of changing their cropping practices so as to separate their susceptible cereal fields, farmers and the USDA launched an "all-out fight" against the barberry bush. The barberry was of course not the cause of the fungal outbreaks--for the nearly continuous expanse of oats, wheat, and barley created the ecological conditions that were conducive to such pathogen outbreaks--but like wolves or grasshoppers, it was isolated as the cause.

As early as 1917 North Dakota state laws required people to eradicate the shrub, and shortly thereafter the USDA dispatched teams of botanists to launch an organized eradication effort. They held demonstration booths at county fairs; they wrote articles in papers extolling the evils of barberry; and they advertised. One such advertisement was a series of "wanted posters" proclaiming things like, "Are you 100% American? Prove it. DESTROY the common BARBERRY. It

spreads the BLACK STEM RUST OF WHEAT." In its appeals to patriotism and finger-pointing tone, their approach to fungus prefigured Senator Joseph McCarthy's approach to so-called insurgents. By 1923 eradication teams, who in all seriousness referred to themselves as the "Rust Busters," had inspected every farm in every county of North Dakota (save three), and had duly rooted out thousands of what they called the "widely-spread, deeply-rooted menace."⁷

Fungus soon became the least of farmers' concerns, however. For nine of the eleven years between 1929 and 1939, the northern Plains suffered from lack of rain. Unlike previous droughts which white farmers had weathered, such as those at the end the 1880s, this time the drought was both prolonged and severe. After a few years, as the lack of rain dessicated the ground so thoroughly that nothing but weeds could grow, the drought revealed what was perhaps the greatest vulnerability of widespread cultivation: the fields themselves started blowing away.⁸ With no perennial grass, the deep roots of which could draw water from sub-soil moisture, the soil was exposed to the blistering heat and blustery wind. Without fail, soil under conditions eroded, and eroded in a big way. The erosion was accelerated by the recent cultivation of millions of acres of shortgrass Plains. There much land was summer fallowed, and so when the rains did not come, it blew even more. Wind erosion from summer-fallowed land had in fact been observed as early as the 1910s. By 1917 the Black Blizzards had started rolling in Montana.⁹ In the 1930s, when prolonged drought and excessive cultivation coincided, the Dust Bowl descended. Though most impressions of the Dust Bowl focus on the southern Plains, including those of the swirling dust clouds, choked cattle, and the Okies, the northern Plains was similarly besieged.

Anne Marie Low (née Riebe) lived through the Dust Bowl on her family's farm, located east of Pingree, North Dakota. From a sampling of her journal entries, later published as Dust Bowl Diary, we can glimpse the drastic effects that the drought and erosion had on the land and people. On April 25, 1934, she wrote ominously that "last weekend was the worst dust storm we ever had. We've been having quite a bit of dirt blowing every year since the drouth started, not only here, but all over the Great Plains. Many days this spring the air is first full of dirt coming, literally, for hundreds of miles." With little or nothing to stop the wind, and plenty of barren fields to contribute more and more dust to it, the Plains was then traversed by airborne rivers of dust. This dust, Riebe said, "sifts into every thing. After we wash the dishes and put them away, so much dust

sifts into the cupboards we must wash them again before the next meal." Over two weeks later, Riebe reported that "the dirt is still blowing." Since the garden was not yet ready to harvest, she picked weeds to have fresh greens. But that year the Riebe's, if they wanted fresh vegetables, would have to eat weeds all summer long. After hauling water to the garden for a couple of months, the Riebe's stopped, lest their well dry up. May was the harbinger of the whole, dry season. "The country doesn't look pretty any more; it is too barren." By July the milk cows had "eaten every weed and blade of grain" in the fields, which had already failed. A month later, by the time the garden had "burned up," she stoically reported,

Everything is just the same--hot and dry.... The drouth and duststorms are something fierce. As far as one can see are brown pastures and fields which, in the wind, just rise up and fill the air with dirt. It tortures animals and humans, makes housekeeping an everlasting drudgery and ruins machinery.... Fifteen feet down the ground is dry as dust. Trees are dying by the thousands....¹⁰

Despite that season's drought, and those which were yet to come, the Riebe's were lucky enough to save their farm, mainly because Riebe's father had avoided borrowing any money. With what little food they could raise, and with what little cash they could earn, the Riebe's stuck it out. However, thousands of farmers across the northern Plains were not so lucky. Embattled by the twin foes of depression and drought, thousands quit the farm as a result of being foreclosed, broken-hearted, or otherwise forced out. Many left and looked for work and to re-create their lives elsewhere. Though the exodus from the northern Plains was not nearly so dramatic as that from the southern Plains, farming families nonetheless fled by the thousands.

At the time and for a long while afterwards, many for various reasons tried to deny that the dust storms resulted from their own agricultural activities. The Dust Bowl, in this view, was rather the result of nature's episodic droughts. The soil would have blown that way, as they would have it, regardless of how the land had been farmed. This explanation of course contains at least a kernel of truth: after all, droughts on the Plains had previously parched the native grasses to such an extent that the wind blew the soil out from under them. The pre-historic ancestors of the Villagers in fact experienced this kind of drought, and layers of loess, or wind-blown soil, from this drought can still be found scattered

around the Plains. However, make no mistake about it: the Dust Bowl was instigated by drought but exacerbated by farm practices. The widespread presence of monocropped and fallowed fields did what it would have taken a drought a decade or so to do: they left the land barren, ready, as it were, to be blown away. What began as a natural disturbance was soon exaggerated by all the millions of disturbances already occurring, and the coincidence of those two patterns--the one human, and the other natural, the one incessant, the other episodic--was tragic. And, in the long run, it was also inevitable. So long as Americans on the Plains maintained their commitment to what Donald Worster has correctly identified as the aggressive, expansionistic, and heedless dynamic of capitalist agriculture, they were to eventually overstep the ecological balance. As he argues in his Dust Bowl, the Dust Bowl revealed not so much the failure of individuals but rather the failure of their economic culture to adjust itself to ecological limits--on the Plains or elsewhere.¹¹

In treating the Plains as though it were a Garden--an unvarying field that was at once fertile and humid--Americans had in a matter of decades turned the Plains into a Desert. Whereas in the early 1800s blowing sand dunes were most prominently a feature of explorers' imaginations, by the 1930s blowing dunes had most certainly been made part of the landscape. In the intervening century the Plains had undergone all sorts of revisions--cultural, economic, agricultural--as well as the ecological revisions which could be gauged in a number of ways. Even more fundamental than the long and morbid list of creatures that were no longer traversing the land, like wolves and buffalo, or swimming the waters, like beaver and muskrat, there were by the 1930s no endless swales of Needlegrass, Red Three Awn, and Blue Grama, and fewer expanses of Cordgrass, Switchgrass, or Big Bluestem. (The last remnants of these tall prairie grasses, ironically enough, would lie along railroad tracks in the Red River Valley.) And the native shortgrass ranges that remained, as a result of excessive and inept grazing, were by the 1930s either "depleted or destroyed," in Mary Hargreaves words.¹² The Dust Bowl poignantly revealed the incongruity between American socio-economic institutions and the Plains--but from an historical perspective it was one instance in a larger pattern of ecological disruptions wrought by the imposition of white technologies, property relations, and economic incentives.

On top of all these forms of ecological desertion--as though to add insult to injury--Americans started to themselves leave the Plains in what became a kind of demographic desertion. For instance, after 1915 the net population movement

in North Dakota reversed direction: thereafter the flow of people was outward, not inward. Through the 1920s and 1930s many left to escape drought and depression, and those who stayed generally increased their landholdings. In this way the remaining farmers, especially those in the shortgrass Plains, acquired more adequately-sized farms. As Dilwyn Robinson argues, a good proportion of this population decrease was a natural realignment of semiarid conditions and settlement patterns: in trying to extend the farming frontier ever-farther westward, and in trying to build an infrastructure for a dense population across the region, settlers had made the "Too-Much" Mistake, and so the reduction were inevitable.¹³ Yet above and beyond these adjustments, Americans and Plainspeople made a "Too-Much" Mistake in the other direction, for as outmigration, farm consolidation and the adoption of labor-saving technologies increased, rural populations started a precipitous decline that continues to this day. Combined, these trends made it possible for fewer and fewer farmers to farm more and more land, and as a result, the size of farms across the northern Plains has increased incrementally ever since.

Agricultural mechanization proceeded slowly in many cases, and did not occur uniformly across the entire Plains, but it eventually had the same effect everywhere: the reduction of farm populations as well as the elimination of contexts in which farm communities engaged each other on a regular and meaningful basis. In addition to replacing farmers with machines--a process of profound agricultural, economic and political import, and one which other authors have already covered--mechanization instituted a technological pattern of life. This pattern was marked in part by the increasing separation of farmers' social and occupational lives. As anthropologist John Bennett found a few decades after mechanization proceeded, very few farm tasks remained that involved sharing of labor, tools, or skills between farmers, with the exception of branding cattle or haying. There were thus few opportunities to enact the old agrarian ethic of mutual aid.¹⁴ The transition from threshing to combines provides a telling instance of how the further mechanization of agriculture disrupted Plains communities.

Around 1920 Plains farmers began buying combines, and within a couple of decades they had become the predominant technology for harvesting and threshing, almost entirely replacing threshers.¹⁵ However, the rise of combines signaled the decline of the various forms of occupational and social engagement that previously centered around threshing. In conjunction with other labor-

saving technologies, combines rent complex and coherent cultural webs apart, promising a more dubious liberation in their place. Isern recounts how combines radically altered community life on the Plains:

Personal relationships with hands and threshermen developed, and techniques of handling and harvest crystallized--until the advent of the combine during the 1920s. Then the whole cultural web of harvesting and threshing fell apart. Every family had its own machine and handled its own harvest with only a little hired help. Technological innovation had recast that aspect of their culture.¹⁶

Combines replaced the cooperative and engagement formerly had while threshing with more "efficient" labor-saving devices. But modern technologies like combines did not merely reduce the quantity of work, for they also reduced what may be called the quality of farm work. As particular instances of modern technology, combines instituted an altogether different pattern of agriculture, one which would increasingly exemplify the characteristics of modern, technological society.¹⁷ Since combines required no social and occupational engagement with others, farm work was progressively degraded from being an engaging experience rich with skills, traditions, and localized variability to being a more monotonous and less social activity. Rikoon explains how modern farm technologies rent apart social fabric in the Midwest, a process much like the disruption of communities on the Plains.

As self-binding reapers replaced manual reaping, raking, and binding grain, as mechanical corn harvesters supplanted the need to husk ears by hand, and indeed as the combined harvester-thresher later motivated threshermen to scrap their rigs, the general result was a disruption of neighborhood groups with their intimacy of association and cooperative organization and a replacement by a more individualistic pursuit.¹⁸

If threshing had actually been an engaging endeavor, why did farmers choose to replace them with combines so quickly? Undoubtedly they thought that combines would liberate them from all the hassles and uncertainties involved in threshing, including sporadic and at times chronic labor shortages; uncertain arrival of custom threshers; and relief from exhausting physical work, especially on the part of women who cooked for all the men. Furthermore, combines promised timely harvesting and less cost per acre.¹⁹ Combines did alleviate farmers from these hassles and uncertainties, but at the same time

combines (and other new technologies, for that matter) replaced the engagement formerly had while threshing with atrophying communities.

Social and cultural engagement waned as each successive aspect of farming, including even entertainment, was mechanized. Put simply, new machines could not replace the engagement people previously had while working and playing together. Like combines, movies were a seemingly innocuous technology that displaced the traditional forms of engagement, like opera houses, which had involved active participation, and patterned disengagement in its place. "By 1905," Ronald Davis reports, "exclusively motion picture entertainment was becoming common.... Plains opera houses that did not become movie theaters were turned into department stores, bowling alleys, warehouses, or funeral parlors."²⁰ And rich social life apparently died with them. In 1951 Jean Burnet observed that as farmers in Alberta increasingly sought entertainment in far-flung larger towns--through new technologies like cars, radios, and televisions--they were decreasingly content with their local community. "Communication within the local community," she observed, "has broken down. There has been a decrease in common understanding and common participation, and a weakening of social co-ordination and control."²¹

The decline of thriving rural communities in the 1920s and 1930s reflected tears in the fabrics in the fabrics of these communities, tears that had been evident from the start. As mentioned earlier, individualistic orientations; ever-rising economic expectations, and acceptance of technical innovations were all characteristic of Plains communities. As the national economy made consumer goods that much more available, and technological innovations increased the scale of farm units, the tears in rural communities were rent further apart. Insofar as rural people looked to urban centers for fulfillment, and farm populations declined, these communities started to "slowly suffocate", as agricultural historian David Danbom has put it.²² In order to breath new life into these communities, and to rejuvenate the land on which they are based, we will need to reform the patterns of agriculture on the northern Plains. I believe that the reforms will necessarily entail shifting the focus of agricultural policy toward the community, and to modeling agricultural practices after the ecology of the grasslands.

¹ Allen and Arnott, Montana Homesteaders, p. 33.

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- ² Ibid., p. 68.
- ³ Robinson, History of North Dakota, pp. 239-241.
- ⁴ Jorgensen, "Agricultural Expansion into the Semiarid Lands of the North Central States During the First World War."
- ⁵ Hargreaves, Dry Farming on the Northern Great Plains, p. 474.
- ⁶ Munro, "Grasshopper Outbreaks."
- ⁷ See Barberry Eradication Campaign Materials, kept in the State Historical of North Dakota.
- ⁸ Robinson, pp. 411-415.
- ⁹ Black, "Summer Fallow in the Northern Great Plains."
- ¹⁰ Low, Dust Bowl Diary, pp. 95-101.
- ¹¹ Worster, The Dust Bowl.
- ¹² Hargreaves, Dry Farming, p. 474.
- ¹³ Robinson, History of North Dakota, passim.
- ¹⁴ Bennett, "Reciprocal Economic Exchanges Among North American Agricultural Operators."
- ¹⁵ Isern, Bull Threshers and Bindlestiffs: Harvesting and Threshing on the North American Plains.
- ¹⁶ Isern, "The Folklore of Farming on the North American Plains."
- ¹⁷ See Albert Borgmann, Technology and the Character of Modern Life.
- ¹⁸ Rikoon, Threshing in the Midwest, 1820-1940: A Study of Traditional Culture and Technological Change.
- ¹⁹ Isern, Bull Threshers; Rikoon.
- ²⁰ Davis, "Opera Houses in Kansas, Nebraska, and the Dakotas: 1870-1920."
- ²¹ Burnet, Next-Year Country: A Study of Rural Social Organization in Alberta.
- ²² David Danbom, "The Future of Agriculture in North Dakota," North Dakota History, 56.1 (Winter, 1989): 31-37.

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